



Popcorn : 3D Model Reconstruction from Calibrated Camera

Senior Project Poster Day 2013

School of Engineering

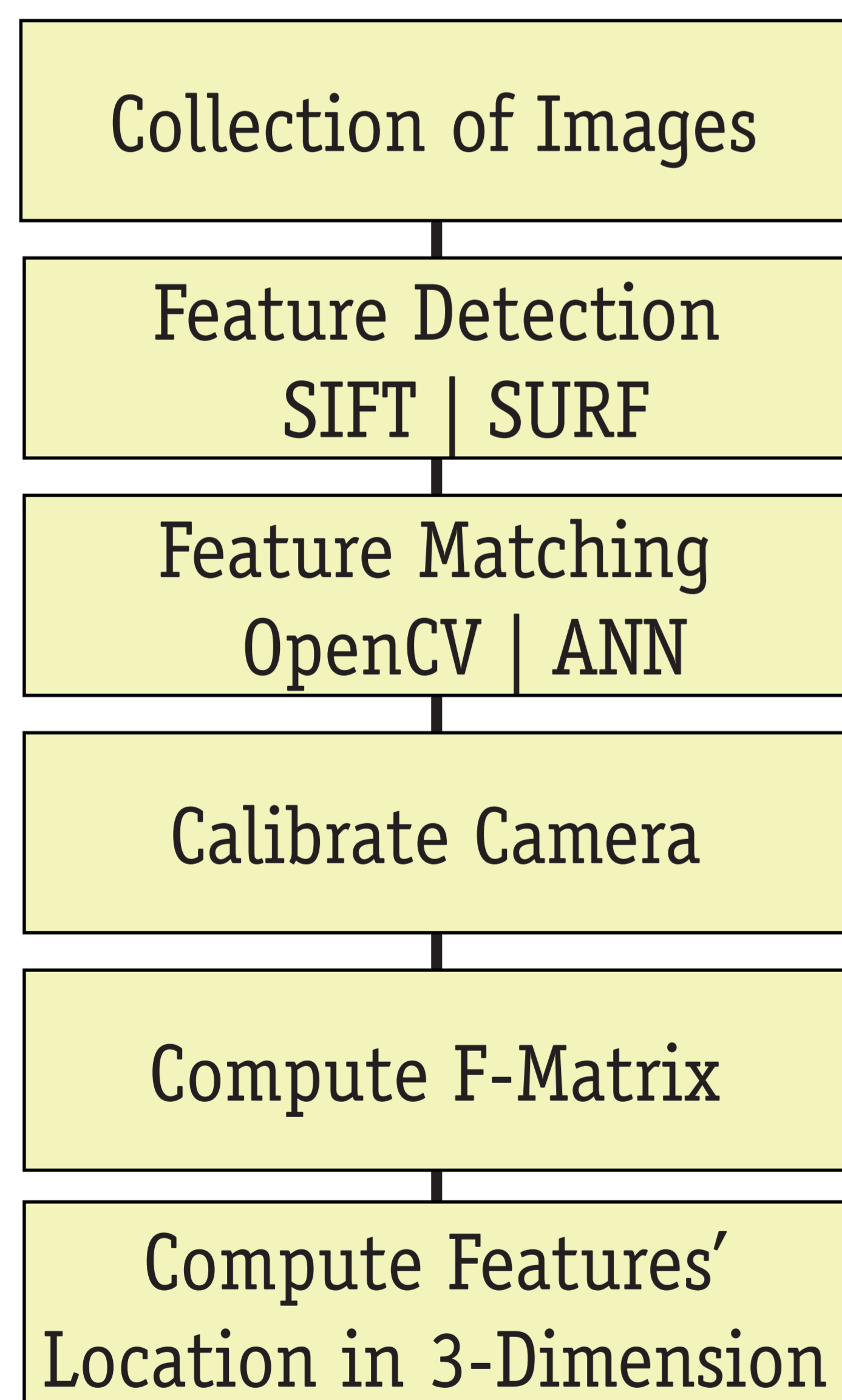
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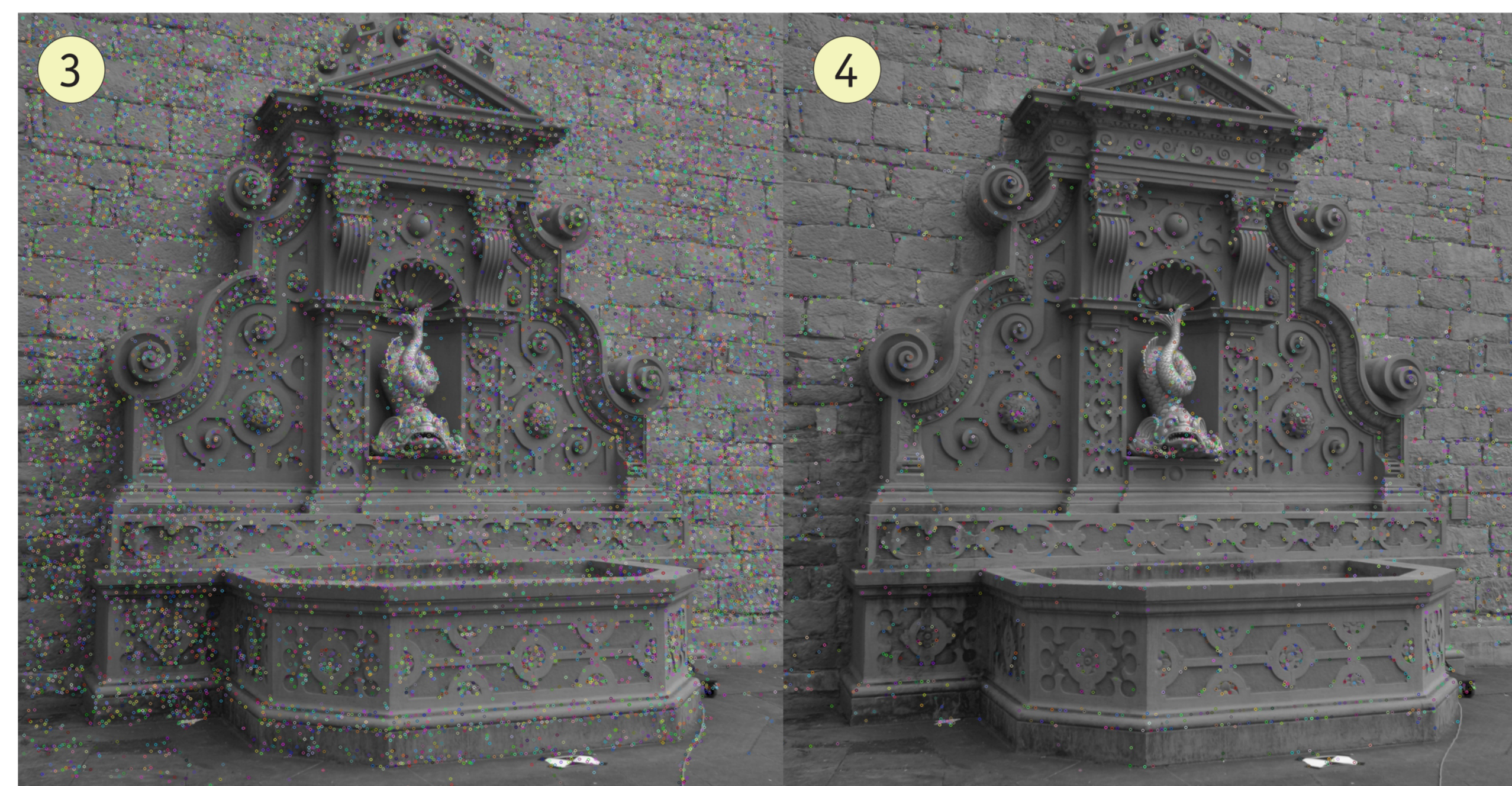
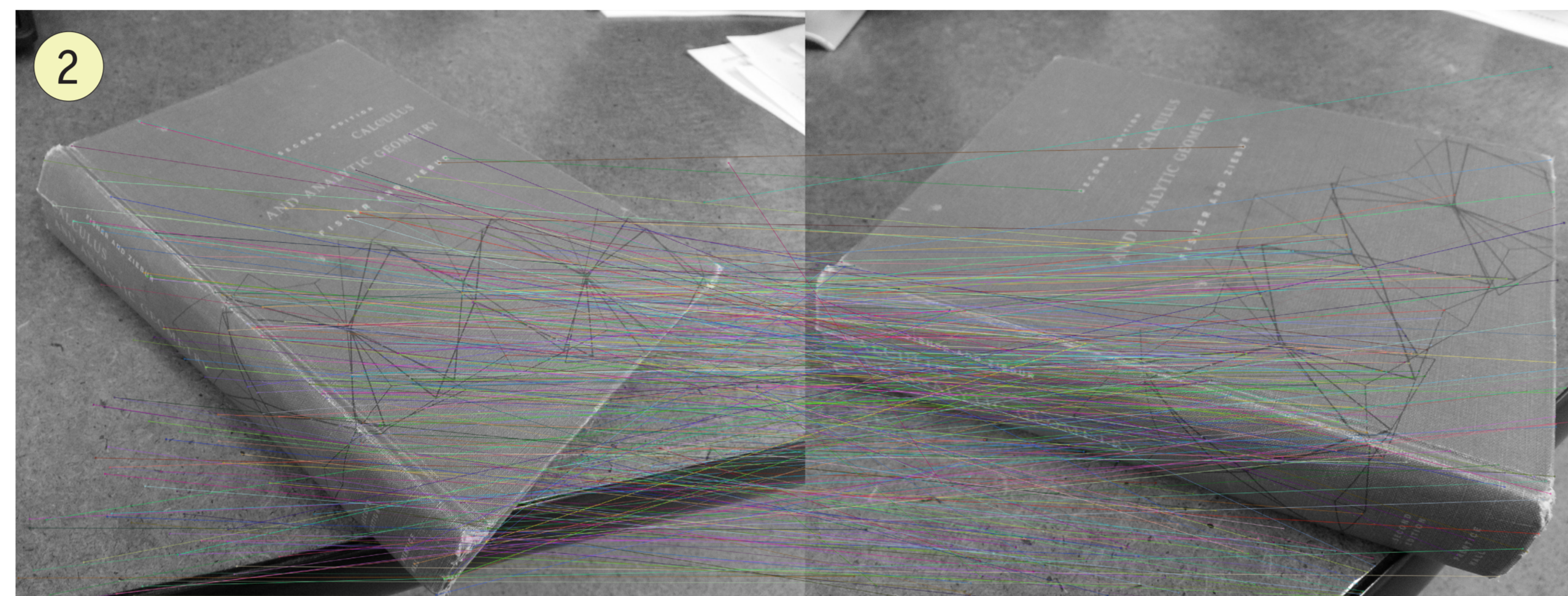
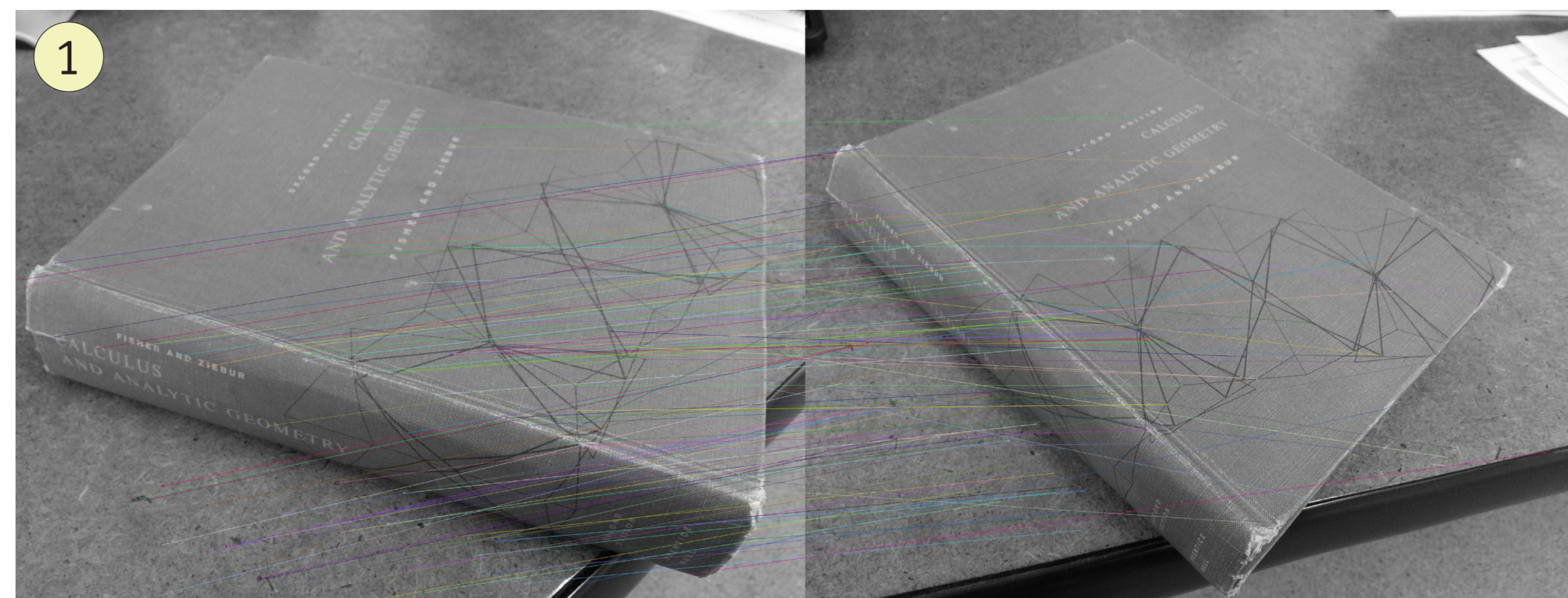
Abstract

Popcorn is a system that constructs a 3D model from two photographs. These two images must be taken by a calibrated camera. The system provides a pipeline for users to calibrate camera using checkerboard pattern, feature selection and triangulation, and 3D point cloud visualization. The reconstruction allows users to be able to revisit the architectural sites while still sitting in front of their computer.

System Design



The system is designed such that each individual components can be independently tested, evaluated, and even substituted. This is very important design choice particularly during the process of feature detection and feature matching which have two methods to accomplish the same tasks.



The first and second images are feature matching using OpenCV and ANN respectively; the third and fourth are feature selection using SURF and SIFT respectively. The system includes following features:

- Camera calibration using checker pattern
- Features selection with options of using SIFT/SURF
- Feature matching with options of using OpenCV/ANN
- Fundamental Matrix computation and triangulation for reconstruction

Test Case : Fountain



Future Works

- Improve the precision in the 3D reconstructed model to allow more accurate representation of the sites.
- Allow users to use photographs taken by uncalibrated cameras with various indifferent weather and light conditions.

Reference & Library

- SNAVELY, N., SEITZ, S. M., AND SZELISKI, R. 2006. Phototourism: exploring photo collections in 3d. ACM Trans. Graph. 25, 3 (July), 835–846.
- Mastering OpenCV with Practical Computer Vision Project by Daniel Lelista Baggio