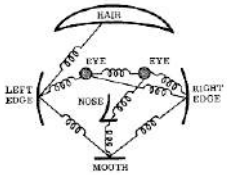
Richard Szeliski

Computer Vision

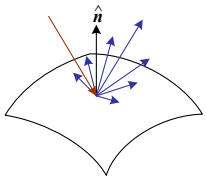
Algorithms and Applications

Springer



1 Introduction **1**

What is computer vision? • A brief history •
Book overview • Sample syllabus • Notation



2 Image formation **27**

Geometric primitives and transformations •
Photometric image formation •
The digital camera

3 Image processing **87**

Point operators • Linear filtering •
More neighborhood operators • Fourier transforms •
Pyramids and wavelets • Geometric transformations •
Global optimization

4 Feature detection and matching **181**

Points and patches •
Edges • Lines

5 Segmentation **235**

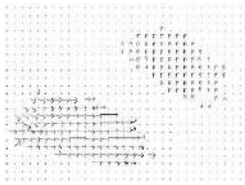
Active contours • Split and merge •
Mean shift and mode finding • Normalized cuts •
Graph cuts and energy-based methods

6 Feature-based alignment **273**

2D and 3D feature-based alignment •
Pose estimation •
Geometric intrinsic calibration

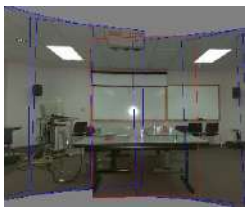
7 Structure from motion **303**

Triangulation • Two-frame structure from motion •
Factorization • Bundle adjustment •
Constrained structure and motion



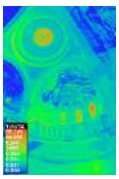
8 Dense motion estimation **335**

Translational alignment • Parametric motion • Spline-based motion • Optical flow • Layered motion



9 Image stitching **375**

Motion models • Global alignment • Compositing



10 Computational photography **409**

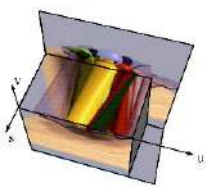
Photometric calibration • High dynamic range imaging • Super-resolution and blur removal • Image matting and compositing • Texture analysis and synthesis

11 Stereo correspondence **467**

Epipolar geometry • Sparse correspondence • Dense correspondence • Local methods • Global optimization • Multi-view stereo

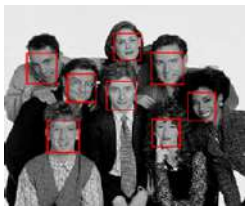
12 3D reconstruction **505**

Shape from X • Active rangefinding • Surface representations • Point-based representations • Volumetric representations • Model-based reconstruction • Recovering texture maps and albedos



13 Image-based rendering **543**

View interpolation • Layered depth images • Light fields and Lumigraphs • Environment mattes • Video-based rendering



14 Recognition **575**

Object detection • Face recognition • Instance recognition • Category recognition • Context and scene understanding • Recognition databases and test sets