Master in
Computer Vision
Barcelona

Module: 3D Vision
Project: 3D recovery of urban scenes
Session 5

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Session 5

Goal: Reconstruction from uncalibrated images with a stratified method (recovery of camera matrices and a sparse set of 3D points)

Mandatory tasks:

- Projective reconstruction (synthetic and real data)
  Factorization method for projective reconstruction
  Compare two different initializations for λ_j^i:
  - $\lambda_j^i = 1$ for all i, j
  - Initialization proposed by [Sturm and Triggs 1996]:
    $\lambda_j^i = \frac{(x_j^1)^T F_{i1}(e \times x_j^i)}{||e \times x_j^i||^2} \lambda_j^1$ with $\lambda_j^1 = 1$
    (the epipolar line of x_j^1 in image i is the line through the corresponding point x_j^i and the epipole e)

  Compare the reprojection error in both cases
- Affine and metric reconstruction (synthetic data)
- Projective reconstruction (real data)
- Affine and metric reconstruction (real data)

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Optional tasks:

- Projective recons. from two views (P, P' from F)
- Projective recons. from more than two views (add a 3rd view)
- Any other improvement you may icorporate (add a 4th view, incorporate new 3D points by triangulation, incorporate new views by resectioning, any processing of the point cloud, ...)

Session 5

Language: MATLAB

Provided functions: lab5.m, euclid.m, homog.m, fundamental_matrix.m, ransac_fundamental_matrix.m, triangulate.m, normalise2dpts.m

lab5.m is the guided file with the different steps of the lab session.

triangulate.m is part of the solution of lab 4.

To Do:

- Complete the code in lab5.m as indicated in the same file (create the functions you may need)
- In the report, comment the results of the different initializations in the projective reconstruction

Session 5

Vanishing point computation:

2014 IEEE Conference on Computer Vision and Pattern Recognition

Finding Vanishing Points via Point Alignments in Image Primal and Dual Domains

José Lezama[*†], Rafael Grompone von Gioi[*], Gregory Randall[†], Jean-Michel Morel[*]
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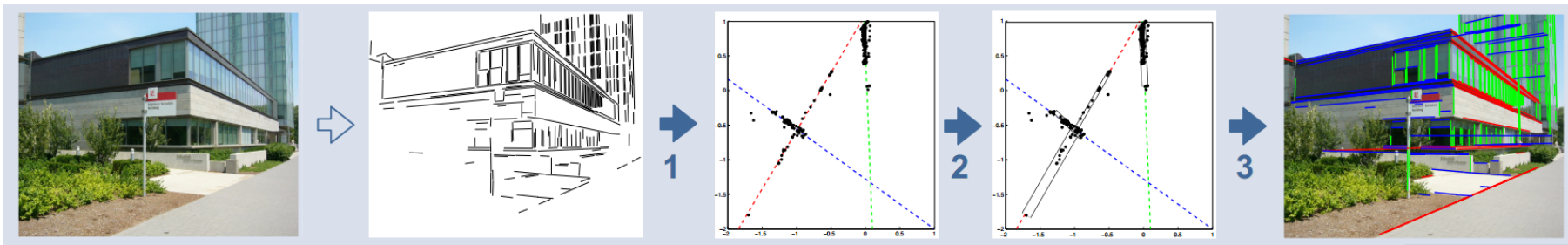

http://dev.ipol.im/~jlezama/vanishing_points/

Evaluation

Grading:

- Report **1.5 points**
- Projective recons. (synthetic data): **3.5 points**
- Affine recons. (synthetic data): **1.25 points**
- Metric recons. (synthetic data): **1.25 point**
- Projective recons. (real data): **1 point**
- Affine recons (real data): **1 point**
- Metric recons (real data): **0.5 points**
- Optional P, P' from F: **+0.5 points**
- Optional add a 3rd view: **+1 point**
- Free optionals: **up to 2 extra points**

Evaluation

To deliver **April 18, before 9am**:

- **Code deliverable:**
  - READY TO BE LAUNCHED on the provided images
- **Short document (around 10 pages):**
  - Results
  - Problems, comments ans conclusions

To deliver **April 20, before 9am**:

- **Final presentation (10 min):**
  - Present an overview/synthesis of all the lab sessions, link the different labs, and comment the results and methods you find more interesting.

Reminder:

- April 20 (project presentation) at 52.011, 52.105, from 16h to 18h
- May 4 (exam) at 52.321, from 16h to 18h