



Master in Computer Vision *Barcelona*

Module: 3D Vision

Project: 3D recovery of urban scenes

Session 1

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Project goals

Main Goal: Learn the basic concepts and techniques to reconstruct a real world scene given several images (points of view) of it.

Scope:

- Use of different image transformations. (week 1)
- Learn affine and metric rectification. (week 1)
- Compute the homography between two images. (week 2)
- Learn camera calibration and self-calibration techniques. (weeks 2 and 5)
- Learn the geometry of two views. (week 3)
- 3D inference from two views: triangulation and depth estimation. (week 4)
- 3D reconstruction from N non calibrated cameras. (week 5)

Datasets

Images of buildings and facades.

- **Facades**

EPFL-Stretcha dataset
castle images: 19 cameras
(calibration matrices)



- **Aerial images**

Brown university 27 different sites of Providence city



Site 13 (234 images)



Site 22(173 images)

Calibration matrices are available.

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Mandatory tasks:

- Function that applies a given homography to an image.
- Play with the hierarchy of planar transformations.
- Compute a line that passes through two points.
- Compute vanishing points.
- Compute a transformed line.
- Affine rectification of an image.
- Metric rectification of an image.

Optional tasks:

- Metric rectification of an image with a single step (pages 55-57, Hartley-Zisserman book).
- Affine and metric rectification of additional facades.

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Language: MATLAB

Provided functions: lab1.m,
guide of the lab with the different steps of the lab session.

To Do:

- Complete the code in lab1.m as indicated in the same file
- Write the function apply_H.m

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Comments on the function apply_H.

Affine and metric rectification need the identification of some lines.



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LSD: a Line Segment Detector

Rafael Grompone von Gioi, Jérémie Jakubowicz, Jean-Michel Morel, Gregory Randall

<http://www.ipol.im>

Session 1

Provided information:



You can assume that windows are square.

Session 1

Provided information:



Evaluation

To deliver **by 9am of the day before** the next lab session:

- **Code deliverable:**

- READY TO BE LAUNCHED on the provided images

- **Short document (10 pages):**

- Results.
 - Problems and comments, conclusions.

Evaluation

Grading:

- Report: **2 points**
- apply_H.m function: **2 points**
- Play with different transformations: **1 point**
- Decompose affinity: **1 point**
- Affine rectification + angles: **2 points**
- Metric rectification + angles: **2 points**
- Optional Metric rectification (single step): **+ 2 points**
- The rest of optionals: **+ 0.2 points each**