Master in Computer Vision Barcelona

Project	Video Surveillance for Road Traffic Monitoring
Module 4	
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Week 3: Tasks Description
Academic year 2015/2016

Master in Computer Vision Barcelona

UAB · UOC · UPC · upf.

Project Schedule
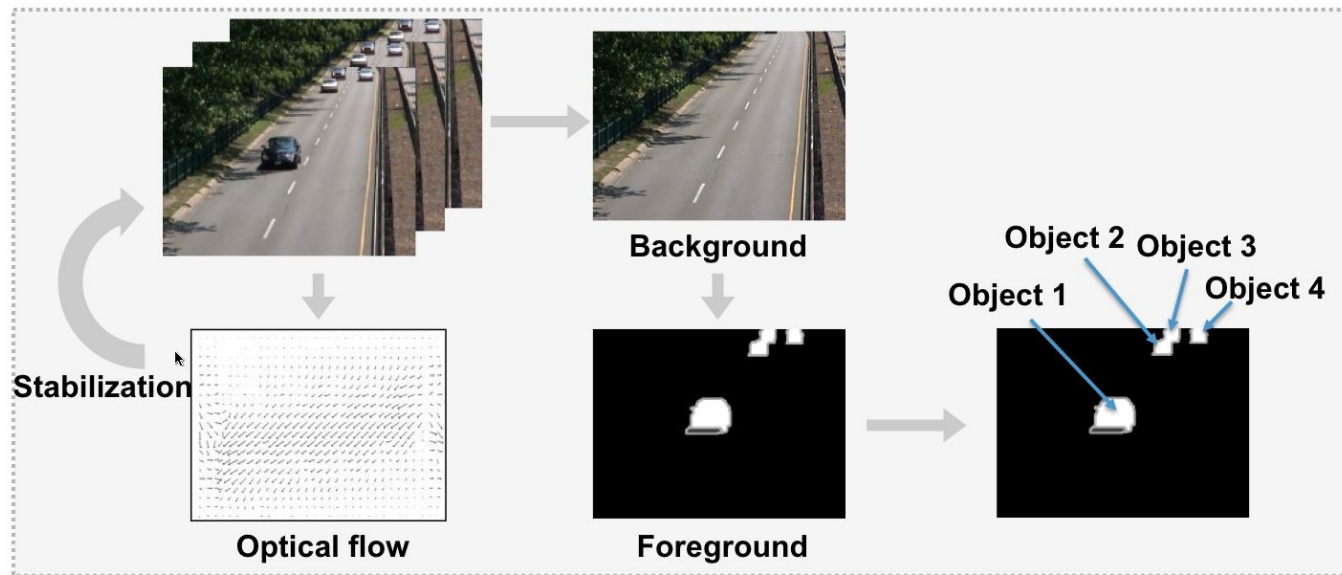
| Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
• Introduction • DB • Evaluation metrics	• Background estimation • Stauffer & Grimson	• Foreground segmentation • Area filter • Hole filling • Shadow removal	• Optical flow • Video stabilization	• Region tracking • Kalman filter	• Presentation

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Goals Week 3

- Implement a robust foreground segmentation algorithm.
- Two basic post-filtering strategies:
  - Hole filling
  - Area filtering
- A strategy to remove shadows.

Tasks

- Mandatory

    - Task 1: Hole fillings.

    - Task 2: Area filtering.

    - Task 3: Precision-Recall (PR) and Area Under the Curve (AUC).

- Optional

    - Task 4: Other solutions.

    - Task 5: Shadow removal.

    - Task 6: Improved Evaluation of Foreground Maps

Sequences

| ID	FRAME RANGE	TYPE
Highway	1050 - 1350	Baseline
Fall	1460 - 1560	Dynamic background
Traffic	950 - 1050	Camera jitter
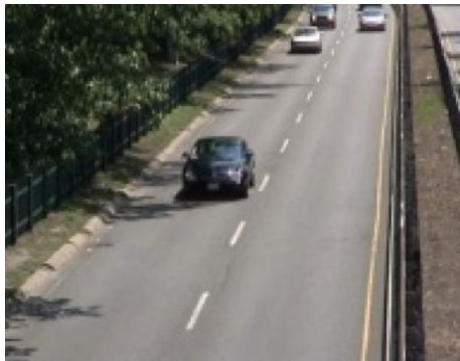
Task 1: Hole filling

- Post-process the configuration from week 2 with the best AUC.

- Apply Matlab's imfill.

- Experiment with 4 and 8 connectivity.

- Results report with absolute AUC & gain (in brackets), per sequence and averaged.

	4-CONNECTIVITY	8-CONNECTIVITY
Highway	xx.xx (+yy.yy)	xx.xx (+yy.yy)
Fall	xx.xx (+yy.yy)	xx.xx (+yy.yy)
Traffic	xx.xx (+yy.yy)	xx.xx (+yy.yy)
Average	xx.xx (+yy.yy)	xx.xx (+yy.yy)

Task 2: Area filtering

- Post-process best configuration (in average) from Task 1.

- Apply Matlab's bwareaopen(BW,P).

- Plot a graph of averaged AUC vs #pixels (P).
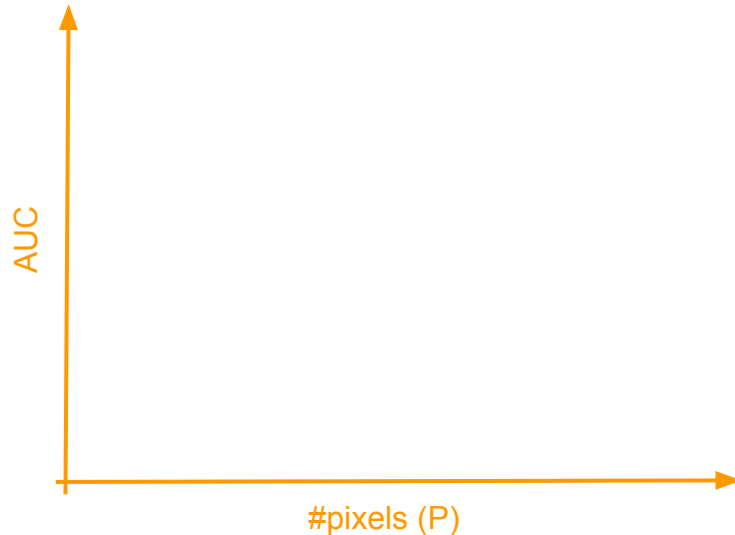
Task 3: PR curve & AUC

- Update your best PR curve and AUC according to the best settings obtained in Tasks 1 and 2.

Task 4: Other solutions (optional)

- Explore with other morphological filters to improve AUC for foreground pixels.
  - Closing
  - Opening
  - Dilation
  - Erosion
  - (...)

Task 5: Shadow removal (optional)

- Search for existing techniques.

- Suggested readings:

[1] Elgammal, Ahmed, David Harwood, and Larry Davis. "Non-parametric model for background subtraction." *Computer Vision—ECCV 2000*. Springer Berlin Heidelberg, 2000. 751-767.

[2] Cucchiara, Rita, et al. "Improving shadow suppression in moving object detection with HSV color information." *Intelligent Transportation Systems, 2001. Proceedings. 2001 IEEE*. IEEE, 2001.

[3] Sanin, Andres, Conrad Sanderson, and Brian C. Lovell. "Shadow detection: A survey and comparative evaluation of recent methods." *Pattern recognition* 45.4 (2012): 1684-1695. [Arxiv]
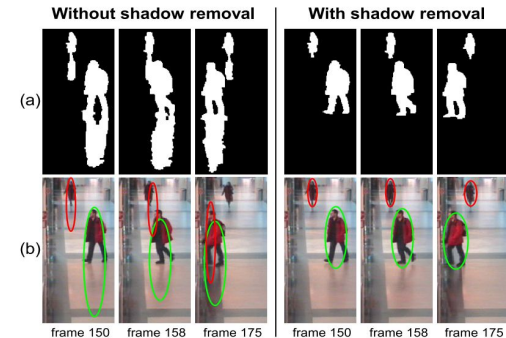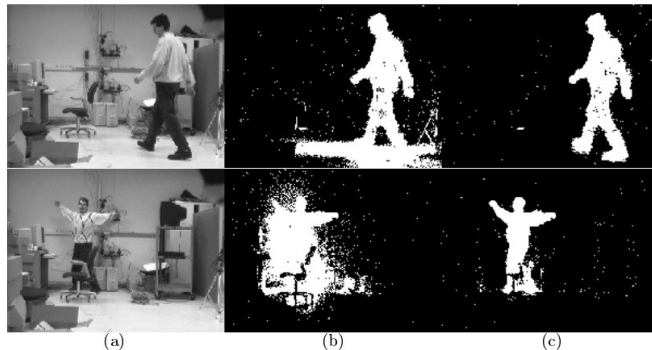
Task 6: Improved Evaluation of Foreground Maps

- Substitute the classic F-measure by the proposal in this paper:

  R. Margolin, L. Zelnik-Manor and A. Tal, "How to Evaluate Foreground Maps?" (CVPR 2014)
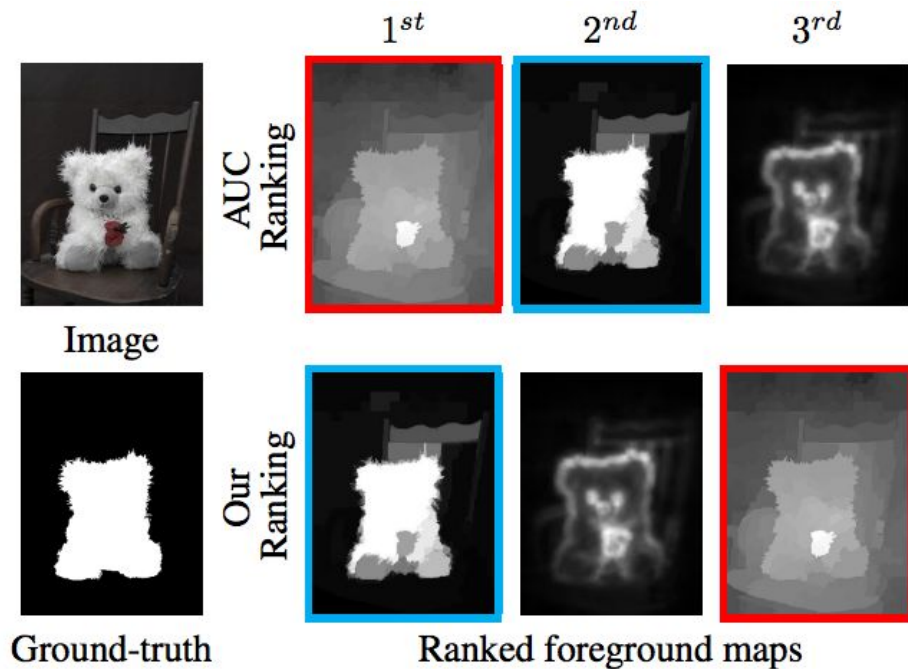
Scoring Rubric

Grade is assigned based on the satisfactory accomplishment of...

Grade	Common meaning	Succesfully completed tasks
9-10	Excellent	All mandatory and two optional tasks
7-9	Very good	All mandatory and one optional tasks
5-7	Average	All mandatory tasks
3-5	Difficulties	All mandatory tasks but one
0-3	Fail	All mandatory tasks but two or more

Deliverables

- **Google drive with slides per tasks**

- **Code used for the week assignment**

- **13th January**
    - **Upload link to GitHub**
    - **Fill the intra-group evaluation**