INF6803

VIDEO PROCESSING AND APPLICATIONS

H2018 – Practical Assignment #1

Video Segmentation

Objectives :

- (Re)Introduce the student to the processing of video and image data in C++ with OpenCV, or in Matlab, or in any other language...
- Allow the student to learn about video segmentation based on background subtraction techniques
- Allow the student to learn about video segmentation based on optical flow techniques

Submission:

- All your source code (if we need to re-run your tests, we should be able to!)
- A report (in **.pdf format**)
- Submit before Feb. 9th, 3:00 PM, on Moodle – **late submissions will not be accepted**
- **You must also submit your report on *TurnItIn*!**
  - Register at www.turnitin.com using the info available on Moodle!

References :

- See course notes on Moodle (Chapter 2)

Other directives :

- The assignments can be done alone or in teams of two; however, submit only one version of your work!

Presentation

In this assignment, you will have to characterize two methods used for the identification of regions of interest in video sequences, and determine which method is better, and in which circumstances. A description of your work, your experiments, and answers to the questions outlined in this document must be included in your report.

In this assignment, you will have to compare two foreground/background video segmentation methods, namely a background subtraction method based on a Gaussian Mixture Model (GMM), and a change detection method based on optical flow. These methods should be briefly presented in class --- you can use your course notes as a reference to understand their basic working principles. For more details, go look online!

In your report, along with a general description of your two methods, you will have to:

1. Identify, based on your theoretical understanding of the two methods, which one should be the best of the two in at least **THREE** specific use cases. For example, which is the best method to use if the camera is not fixed? Why? And if the contrast is low?
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2. Describe in detail the experiments realized to test the hypotheses of the previous point. Which dataset did you use? What are the difficulties in this dataset's videos? Which evaluation criteria did you use? Did you rely on an external framework to test your code?

3. Describe the implementation of the two studied methods. If you did not write all the code yourself, where does it come from? Did it require modifications? Otherwise, from which papers or websites did you inspire yourself to write it? In all cases, what are the primary parameters of your methods? How did you set their values?

4. Provide the evaluation results from your experiments related to the hypotheses of the first point. Use a proper format for their presentation --- tables, figures, ...

5. Discuss the results of the fourth point in relation with the hypotheses of the first point. Which hypotheses are supported by these results? Which are not? Which test resulted in a lack of conclusion? How could you improve these tests?

During the lab periods, do not hesitate to ask questions to the TAs --- they can help you with any technical issue if you are working on Windows/Linux, or if you are coding in C/C++ or Matlab.

Marking scheme

Report:

- Presentation of the two methods (general principles, in your words) = 4 pts
- Performance hypotheses in specific use cases = 3 pts
- Description of experiments and datasets = 2 pts
- Description of the implementations used = 2 pts
- Experimentation results = 3 pts
- Discussion on results and prior hypotheses = 3 pts
- Readability, property, and completeness = 3 pts

Total on 20 pts.

You will be penalized by 50% of the total grade if you do not hand in your code. Also, if your report is not submitted to *TurnItIn*, it will not be graded. For the length, we expect something between 8 and 15 pages, but if you produce something longer, it does not matter too much (just please don't hand in 50 pages). The order of presentation for the topics listed above does not matter either, as long as they are all present.

References

- Matlab Cheat Sheet:

  http://web.mit.edu/18.06/www/Spring09/matlab-cheatsheet.pdf

- Full Matlab Guide:

  http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf

- C++ : Open Source Computer Vision Library (OpenCV)

  http://opencv.org/

  http://docs.opencv.org/doc/tutorials/tutorials.html