INF6803

VIDEO PROCESSING AND APPLICATIONS

H2018 – Practical Assignment #2

Description and comparison of regions of interest

Objectives :

- Allow the student to learn about image description based on color histograms
- Allow the student to learn about image description based on Scale-Invariant Feature Transform (SIFT)

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 March 16th, 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

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 description of regions of interest in images, and determine which method is better, and under 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 region description methods, namely a method based on color histograms (in RGB, HSV, HSL, Lab, or any other color space you which to use), and a method based on SIFT extraction. 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! Your goal here is to determine which approach works best when trying to match image regions from two different images under varying conditions (e.g. using different region sizes, under illumination variation, under affine transformations, etc.).

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 size of the compared regions is very large (e.g. 200 pixels by 200 pixels)? Why? And if their content is relatively uniform?

2. Describe in detail the experiments realized to test the hypotheses of the previous point. Which dataset did you use? What difficulties are there in these? 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.

Reminder: do not try to reimplement everything yourself, unless you have lots of free time! Part of the learning experience is to figure out which preexisting tools to use...

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