CMPSC 310
Artificial Intelligence
Fall 2018
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Lab 4 Part 1
24 September, 2018
Due: 1 October by 2:30 pm
This is a team lab (of two or three).

Objectives

To learn how to use a computer vision `OpenCV` software and a Python programming language for computer vision applications. To correctly apply smoothing, blurring, thresholding and edge detection to images using OpenCV functions. To gain understanding of image processing techniques that can be used for specific computer vision applications.

Reading Assignment

You should carefully read and follow the Chapters from the supplemental reading.

Also, as you write your reflection, please refer to the relevant "GitHub Guides", available at https://guides.github.com/, that explain how to use many of the features that GitHub provides.

Overall Goals and Structure

This laboratory assignment is divided into two parts. The stated deliverables for each part of the lab are to be submitted by the due date. This lab consists of three separate lab grades: one grade for the tasks outlined in first part of the lab, and two grades for the second part of the lab (for the specific implementation and for the overall system design, experimentation and analysis). The second part of the lab will be given on October 1.

During the first portion of the lab, you will get comfortable using OpenCV and learn how to apply specific functions for image transformation and manipulation. The first portion of the lab is built on the book by Adrian Rosebrock, select chapter of which has been provided for you with this lab.

Accepting the Assignment on GitHub

Since this is your second team-based assignment you will follow the same steps from the previous lab. The only exclusion is that you must work with at least one person you did not work with in the previous lab. Please note that for group assignments only one person will be creating the team while the other team members will join that team.

The selected person of the team, a.k.a. team project manager, should go into the #labs channel in our Slack team and find the announcement that provides a link for it. Copy this link and paste it into your web browser. Now, you should accept the laboratory assignment and create a new team with a unique and descriptive team name (under "Or Create a new team").

Now the other members of the team can click on the assignment link and select their team from the list under "Join an Existing Team". When other team members join their group in GitHub Classroom, a team is created in our GitHub organization. Every team member will be able to push

and pull to their team's repository. Your team's project manager should be the one to resolve any conflicts or merge pull requests.

Unless you provide the instructor with documentation of the extenuating circumstances that you are facing, not working in a team and not accepting the assignment means that you automatically receive a failing grade for it.

Image Manipulation and Transformation Functions

You will experiment with OpenCV and Python by going through the given program and following the tutorial style book given as a supplement. If you are not familiar with a Python programming language, you may refer to Python library documentation. You will also find additional introductory materials on Python in the `lab3` directory of the lab repository.

1. Study the program called `src/colorspaces.py` in the lab repository. Please refer to the OpenCV Color Conversation Documentation to enhance your understanding of the program.

2. Follow the Chapters 8, 9 and 10 in the "Practical Python and OpenCV" book to learn about smoothing and blurring, thresholding, and edge detection. As a result of this work, you should produce the following programs: `blurring.py`, `simple_thresholding.py`, `adaptive_thresholding.py`, `otsu_and_riddler.py`, `sobel_and_laplacian.py`, and `canny.py`.

3. Apply edge detection program to your own image. You may need to modify the program to ensure it is able to properly detec object edges in your image. Save your output and incorporate it into your reflection.

4. Write `writing/reflection.md` document that contains:

   - one paragraph explanation for the `src/colorspaces.py` program;
   - one paragraph reflection on the smoothing and blurring, thresholding, and edge detection techniques. You should discuss any problems you have encountered or any misunderstandings you may still have. You should also provide one complete example for an application of these methods.
   - one paragraph reflection of applying the edge detection to a different image. Please discuss if the technique worked well for the image you selected, if not, what did you need to modify. Finally, please include the output of the edge detection program using your image. You must incorporate your output image into your reflection Markdown file (see Mastering Markdown for an example).

Required Deliverables

This assignment invites you to submit electronic versions of the following deliverables through your lab repository.

1. `src/blurring.py`, `src/simple_thresholding.py`, `src/adaptive_thresholding.py`, `src/otsu_and_riddler.py`, `src/sobel_and_laplacian.py`, and `src/canny.py` programs.

2. A `writing/reflection.md` document.