Lab 1 – Registration and Introduction to the Lab

Goal: Introduction to the IP lab sessions, getting familiar with programming in Google Colab, basic IP operations.

Section A - Introduction to the IP Labs

Welcome to the Image Processing (IP) lab!

In this section we will cover some general guidelines, relevant for all IP lab sessions. In the following lab sessions, we will implement image processing techniques learned in the lectures.

A few notes:

1. Lab assignments will be completed in Python using Google Colab.
2. The assignments will be done in pairs.
3. The assignments will not include intensive coding. However, knowledge of basic Python operations is required.

I. Google Colab

1. Google Colab is a free cloud platform, which enables writing and executing Python in a web browser environment, with zero configuration required.
2. An overview of Google Colab can be found at [4], [5], [6].
3. Use your student Google account to sign into Google Colab.
4. You will need to upload relevant files (images, etc.) to your Google Drive and then change the working directory within your Google Colab notebook.

II. Report Submission and Grading

1. Preliminary reports are to be submitted in Moodle before the corresponding lab.
2. Final reports are to be submitted, **electronically**, up to **two weeks** after the lab in **PDF** format and should include all the used code, outputs and answers.
3. Make sure you add titles to plots and names to axes where needed.
4. Preliminary reports should be named “ex1_pre_id1_id2.pdf” and final reports should be named “ex1_final_id1_id2.pdf” with the prefix “ex1” updated each experiment.
5. Late submission will be awarded with penalty points.

6. Grading will be given according to completeness, clarity and quality of reports. An emphasis will be given to the understanding of the demonstrated principles.

III. Exporting Google Colab Notebooks to PDF

1. Once completed, save your Colab notebook (.ipynb file) in a folder within your Google drive.
2. Run the provided "print2pdf.ipynb" using Google Colab. Follow the steps in the notebook.
3. Note that it supports only English. If you'd rather provide your answers in a different language, you may write your answers in another PDF and merge it to your notebook.
4. You may use any other method, however, make sure your code, outputs and answers are shown completely and clearly within your report.

Section B – The Experiment

I. Preliminary Work

1. Run Google Colab and make sure you are familiar with basic file upload operations to your Google Drive.
2. Make sure you are familiar with the Python libraries: numpy [1], matplotlib [2] and scikit-image [3].
3. Find a .bmp image that will be used in the lab.

II. Description of the Experiment

1. Upload your image and supplied materials to a folder in your Google Drive.
2. Run **Intro.ipynb** using "Google Colaboratory".
   i. Mount to your Google Drive using your Google credentials.
   Important – make sure you use the credentials associated with the Google account used for uploading your files.
   ii. Follow the instructions in the Intro notebook. Make sure you fill your IDs at the top of the notebook.
   iii. When you finish with the notebook save all your changes and outputs.
   iv. Export and save your results and answers in a PDF.

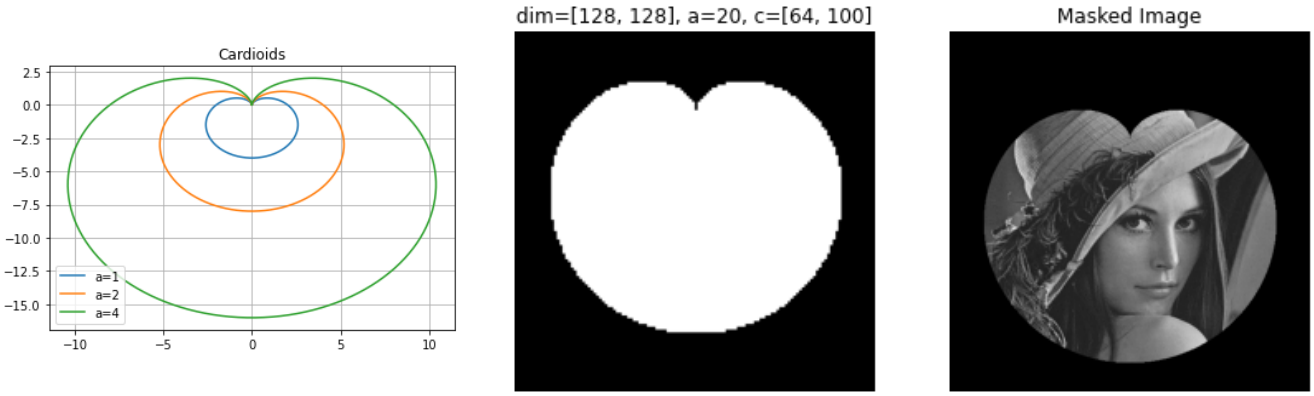

Figure 1: Left to right – Cardioids plot, Cardioid binary mask and masked image.

3. Run **ImgThresholding.ipynb** using "Google Colaboratory".
   i. A binary image contains only 2 intensity levels, usually 0,1 (or 0,255 in the 8-bit representation).
   ii. In this notebook you will generate binary images through thresholding.
   iii. Follow the instructions in the notebook. Make sure you fill your IDs at the top of the notebook.
   iv. Export and save your results and answers in a PDF.

4. Run **ImgMasking.ipynb** using "Google Colaboratory".
   i. In this notebook you will generate Cardioid shaped binary masks, and then apply them on your image to generate masked images (see figure 1).
   ii. Having relatively simple geometric interpretation, the Cardioid is well known for its resemblance to a heart.
   iii. Follow the instructions in the notebook. Make sure you fill your IDs at the top of the notebook.
   iv. Export and save your results and answers in a PDF.

III. Submission Guidelines:

1. Make sure you add titles and legends to your plots where applicable.
2. Provide clear and brief explanations when required.
3. Verify your code, outputs and answers appear completely within your report.
4. Merge your PDF files into one document named "ex1_final_id1_id2.pdf". Each pair should submit the report once to the corresponding box in Moodle.

IV. References

1. https://matplotlib.org/index.html
2. https://docs.scipy.org/doc/numpy/user/quickstart.html
3. https://scikit-image.org/
4. https://colab.research.google.com/notebooks/intro.ipynb
5. https://medium.com/@oribarel/getting-the-most-out-of-your-google-colab-2b0585f82403
6. https://medium.com/deep-learning-turkey/google-colab-free-gpu-tutorial-e113627b9f5d

Good Luck!