
HOMEWORK ASSIGNMENT

NAZARBAYEV UNIVERSITY | SCHOOL OF SCIENCE AND TECHNOLOGY

PROJECT 1

This is the first homework assignment for Image Processing class. The project aims at evaluation of knowledge obtained by students in the first weeks of classes: that is the nature of a digital image and implementation of basic operations on digital images. Additionally, the assignment evaluates the programming skills and mathematical background of a student.

DUE DATE

9 February 2018, Friday.

METHOD OF DELIVERY

Assignment deliverables (code, report, initial and final images) should be submitted via Moodle to the course instructor before the due date.

LEVEL OF COLLABORATION ALLOWED

Collaboration is not allowed on this assignment – each student should perform the assignment individually.

ESTIMATED TIME FOR COMPLETION

20 hours

ADDITIONAL SUPPORT

Please contact the course instructor and/or teaching assistants if you need any assistance or have any concerns about this assignment.

ASSIGNMENT DELIVERABLES

Students are expected to submit:

- MATLAB script – implementation of the task.
- Report – which describes in detail how the student approached the problem, designed a solution and implemented it.
- Image database (if a student generated one himself/herself).

GRADING CRITERIA

60% - task accomplishment, quality of work, programming and final report evaluation

10% - for development of personal image database for creating the mosaic

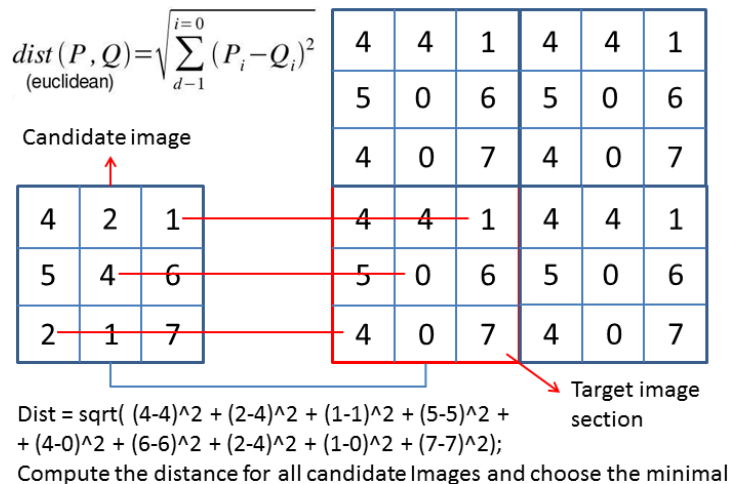
20% - for implementation of a different shape (circular, parallelogram, etc...)

10% - awarded if the size of a patch is adjustable

ASSIGNMENT DETAILS

Mosaic is the art of creating images with an assemblage of small pieces of colored glass, stone, or other materials. Photo mosaic is the technique, where the original image is divided into (usually) uniform rectangular grids, each of which in its turn contains a different image. The general look (low magnification) over the photo mosaic shows the original image, whereas looking closer at the image shows the smaller constituent items.

By convention, there are two techniques of developing such mosaics based on the matching technique. The first, and considered simplest, reduces every section of the original target image to a single color. Images from a database are calculated for their average, and put into sections with which their average color is as close as possible to the color of the section. This effectively reduces the resolution of a target image and produces generally a coarse mosaic. Second method involves more computation, but produces higher quality image mosaics. This technique compares the value of each target image's section pixel to corresponding pixel from a candidate database image. Difference values are then summed, and the image which is the "closest" to the region is chosen. See the technique illustration and example mosaic below.



In this assignment you are provided with dataset of images obtained from Youtube videos (if you cannot download the dataset due to slow connection, please come with external storage device to your TA). The dataset for this assignment can be downloaded using the following link <https://goo.gl/2gnR6a>. Using the database, you need to create an image mosaic. You should firstly decrease the size of the original images to convert them to patches. After creating the patch database of reduced sized images, you will divide the original image into smaller parts of this patch size and you will find the most suitable patch from the database to represent this part using one of the methods explained above.

You should use rectangular patches by default. However, you are encouraged to implement different shaped patches (for instance circle, ellipse, and parallelogram) to get the 20 percent of the project grade. Note that there are additional problems with shapes other than rectangular. For instance, circular patches cause unusual shaped gaps between circular patches, which you are also expected to fill appropriately.

Pay attention to the Grading Criteria. 10% of the grade will be awarded if a student generates his/her own dataset. You can create a dataset from image snapshots, for this you can use the software like this: http://paul.glagla.free.fr/imagegrab_en.htm , or similar. 20% is given for circular patch mosaic implementation, and 10% are awarded if the size of a patch is adjustable. Your code should be a MATLAB function with clear inputs and outputs. Execution time limit is 10 minutes at max. Please see examples of image mosaics below. First one is comprised with rectangular shaped sections of different sizes. The second mosaic is made of uniform sized hexagonal shaped sections.

