ASSIGNMENT2

DIGITAL IMAGE PROCESSING (DIP) - CSE 478

DEADLINE: 2ND SEPTEMBER (FRIDAY), 11:50PM

(1) Apply highboost filtering on the image bell.jpg, compare results by varying window sizes (for smoothing filter) and k (the weight factor). Illustrate the steps.

(2) (a) Write functions to build Gaussian Pyramids and Laplacian Pyramids from an input image (two different functions). Your function should take as input the image and the number of levels required and should output the pyramids.
(b) Write a function to reconstruct your image back from the Laplacian Pyramid
(c) Now use the build and reconstruct functions of Laplacian Pyramids to blend the cows from the image (source.jpg) into target image (target.jpg) using the mask image (mask.png). Observe the results with varying number of levels (from 2 levels to 4 levels of the pyramid).

(3) Take *your* RGB face image with a non-plain background and do the following. (Do not use any inbuilt functions)
(a) Compute integral image from face image. Show the 8 bit integral image in the report.
(b) Reconstruct face image back from the integral image obtained from part(a) (without using loops/recursion).
(c) Write your observations on difference between original image and the reconstructed image. Can you think of the various applications where we can use integral image (except from object/face detection)?
(d) How many addition operations are there in your implementation ? Can you reduce the number of addition operations by half (2MN where MxN is the size of your face image)? Does it also affect storage, if yes please write your observations.

(4) We discussed the edge preserving bilateral filter in the class. A detailed description with equations can be found at the wikipedia page (`(https://en.wikipedia.org/wiki/Bilateral_filter)`). Attempt the following:
a) Implement an 5×5 bilateral filter and apply it to the gray scale image "face.png" (Note: be careful in choosing the value of σ).
b) The filter can be extended to color images by simply applying the filter to each color channel separately. Use the image "boy-smiling.jpg" to test color image bilateral filtering with different window sizes (5×5; 10×10 and 15×15) and different values of σ. Comment on the effect of changing window sizes and σ.
c.) Does it makes sense to develop an inverse bilateral filter, which blurs an image at edges and preserves the homogenous regions. If it makes sense, design

an inverse bilateral filter and suggest its applications.

(5) (a) Write a function to perform image warping given a transformation function.
(b) Use it to implement the Twirl transform given in the lecture slides.