Research Institute for Future Media Computing

未来媒体技术与计算研究所

http://futuremedia.szu.edu.cn

Coursework: Deep Learning Based Super-resolution of Approximately Extracted Images in DCT Domain

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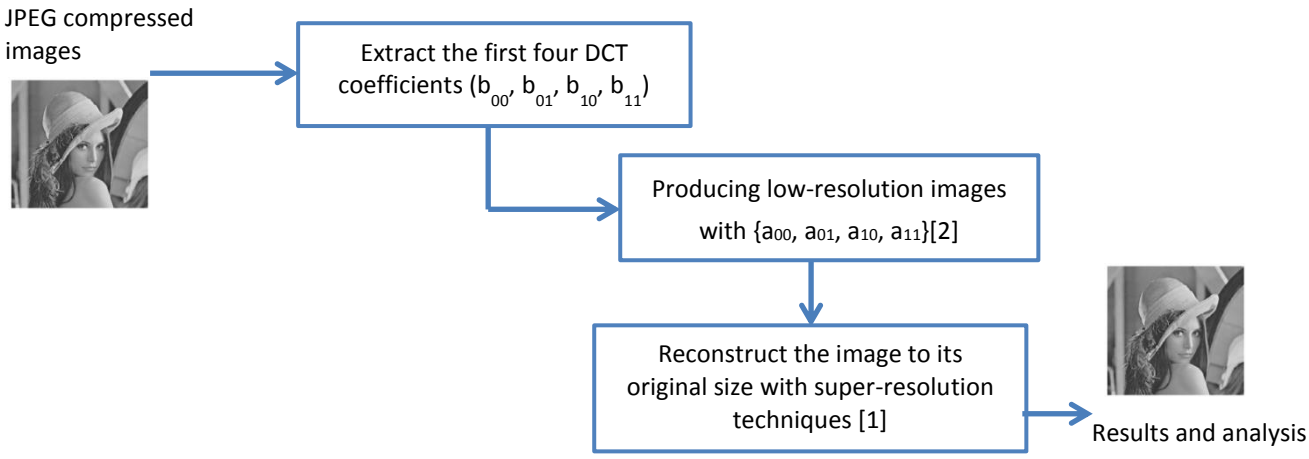

The course work requires you to implement an image reconstruction system as shown above. You can do the coding in your own preferred programming language from scratch or download the existing source codes for the work reported in reference [1] and [2]. To download the source code for [2], please visit the WEB site: http://futuremedia.szu.edu.cn, click the button at the bottom "Research Space" and then download the source codes named as "ImageExtraction". The source codes for reference [1] are available by following the link given in the paper.

Details of the instructions and corresponding marking criteria for this coursework are given below:

1) Select a set of 10 images from the same test data set as reported in the reference paper [1], and use these 10 images as your input for the coursework. Apply JPEG to compress the 10 images, identify the top four DCT coefficients {b_{00}, b_{01}, b_{10}, b_{11}} for each block, and extract a block of 2x2 approximated pixels {a_{00}, a_{01}, a_{10}, a_{11}} as given below to derive the low-resolution image (alternatively, you can download the source codes from the WEB site: http://futuremedia.szu.edu.cn and click 'Research Space', then select 'ImageExtraction' (20 marks):

$$\begin{bmatrix} a_{00} & a_{01} \\ a_{10} & a_{11} \end{bmatrix} \approx \frac{1}{8}\begin{bmatrix} (b_{00}+b_{10}+b_{01}+b_{11}) & (b_{00}+b_{10}-b_{01}-b_{11}) \\ (b_{00}-b_{10}+b_{01}-b_{11}) & (b_{00}-b_{10}-b_{01}+b_{11}) \end{bmatrix}$$

2) Apply the super-resolution technique as reported in [1] to reconstruct all the 10 low-resolution images to their original sizes (20 marks);
3) Write a report to include: (i) Introduction (Section-1) to set up the background, the research problem, and the tasks required for the coursework (maximum one page); (ii) Methods (Section-2) to record what you have done, how you implement the above system, and any new ideas of

your own, which are introduced to show that your implementation is different from those reported in the two references (maximum three pages); (iii) Experimental Results and Analysis. In principle, you should present your experimental results by following those reported in reference [1]. The minimum requirement is that your results should be presented to include two parts, where part-1 is a table of PSNR values as shown below, and part-2 includes three rows of 10 image samples (row-1 for original images, row-2 for the super-resolution reconstructed images via [1], and row-3 for the reconstructed super-resolution reconstructed images via your own ideas (i.e. improved over [1]) if any) (60 marks).

Experimental Results in PSNR values

Images	I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	I-10
PSNR-1										
PSNR-2										

Note: PSNR-1 are the PSNR values derived for super-resolution reconstructed images via [1]; PSNR-2 are the PSNR values derived for super-resolution reconstructed images via your own ideas generated to improve the technique reported in [1].

4) Deadline for submission: 31th of December, 2017.
5) Please upload your report together with your source codes to the following WEB site:
   http://172.31.70.60/fmwiki/doku.php?id=public:assignment
   On this WEB site, you need to log in with username: student, and password: 123456 and then follow the instructions. Any problem, please contact: 叶弘慎,834289868@qq.com;
6) Note if you only upload a report without the source codes, your marks will be halved.

References:

[1] Lai W., Huang J., Ahuja N. and Yang M. 'Deep Laplacian Pyramid Networks for Fast and Accurate Super-Resolution', CVPR2017;
[2] Jiang J. and Weng Y. (2004) "Video Extraction for Fast Content Access to MPEG Compressed Videos" *IEEE Transactions on Circuits, Systems and Video Technology*, Vol 14, No 5, 2004,pp595-605;