ECE 634: Digital Video Systems
Spring 2017
Instructor: Prof. A. R. Reibman

PURDUE
UNIVERSITY

Programming Assignment 1

Block Matching
(Last update: January 24, 2017)

There are 3 parts to this assignment. The first and second are required, the third is optional. You may find the third useful, because several other assignments will depend on motion estimation, and the third will compute faster than the first or second.

Part 1: Write a C/C++, Matlab, or Python program for implementing an exhaustive search block matching algorithm with integer-pel accuracy.

- Program inputs: video sequence, block size, search range.

- Program outputs: estimated motion field.

- Assignment deliverables:

    - Program source code
    - Plot of estimated motion field for two images from video sequence. (In Matlab, use function 'quiver')
    - The predicted image, the prediction error image
    - The PSNR of the predicted frame relative to its original
    - A report describing your findings

- Explorations

    - Impact of different search range
    - Impact of different predicted-block size (16*16 as starting point)

Start with one of the sample YUV videos provided on the course web page, since they are small and motion compensation can be slow to process. Choose two frames that have sufficient motion between them so that it's easy to observe the effect of inaccurate motion estimation. If necessary, choose frame that have several intervening frames. Then use your own content. See web-site for method to use **mencoder** to create a YUV file.

Part 2: Write a C/C++, Matlab, or Python program for implementing an exhaustive search block matching algorithm with **half**-pel accuracy.

- Program inputs: video sequence, block size, search range.

- Program outputs: estimated motion field.

- Assignment deliverables:

    - Program source code

– Plot of estimated motion field for two images from video sequence. (In Matlab, use function 'quiver')

– The predicted image, the prediction error image

– The PSNR of the predicted frame relative to its original

– Compare the predicted image and its PSNR with results from integer-pel accuracy

– Compare execution time relative to results from integer-pel accuracy

– A report describing your findings

- Explorations

  – Impact of different search range

  – Impact of different predicted-block size (16*16 as starting point)

Part 3: Write a C/C++, Matlab, or Python program for implementing **hierarchical** block matching algorithm.

- Program inputs: video sequence, block size, search range.

- Program outputs: estimated motion field.

- Assignment deliverables:

  – Program source code

  – Plot of estimated motion field for two images from video sequence. (In Matlab, use function 'quiver')

  – The predicted image, the prediction error image

  – The PSNR of the predicted frame relative to its original

  – Compare the predicted image and the PSNR of the predicted image with results from integer-pel and half-pel accuracy

  – Compare execution time relative to results from integer- and half-pel accuracy

  – A report describing your findings

- Explorations

  – Impact of different search range

  – Impact of different predicted-block size (16*16 as starting point)