Introduction to Multimedia Homework 3

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Predicted images (full search)

Block size=8; Range=8

Block size=8; Range=16

Block size=16; Range=8

Block size=16; Range=16

Predicted images (3-step search)

Block size=8; Range=8

Block size=8; Range=8

Block size=16; Range=8

Block size=16; Range=16

Motion Vector (full search)

Block size=8; Range=8

Block size=8; Range=16

Block size=16; Range=8

Block size=16; Range=16

Motion Vector (3-step search)

Block size=8; Range=8

Block size=8; Range=16

Block size=16; Range=8

Block size=16; Range=16

Residual image (full search)

Block size=8; Range=8

Block size=8; Range=16

Block size=16; Range=8

Block size=16; Range=16

Residual image (3-step search)

Block size=8; Range=8

Block size=8; Range=16

Block size=16; Range=8

Block size=16; Range=16

Implement Full Search

- Divide target frame in blocks
- For processing each target frame block, draw the search range in reference frame
- Compare every pixel for target frame and reference → we can get SAD
- Use the smallest SAD and put the block from reference to estimated frame.
- Motion Vector = motion_estimation = difference between reference frame block and target frame block

Implement Three-step search

- Same as full search, just edit some parts
- Three-step-search when draw the search range: (skip p pixel)

  for ii=center_py-search_range : search_range : center_py+search_range

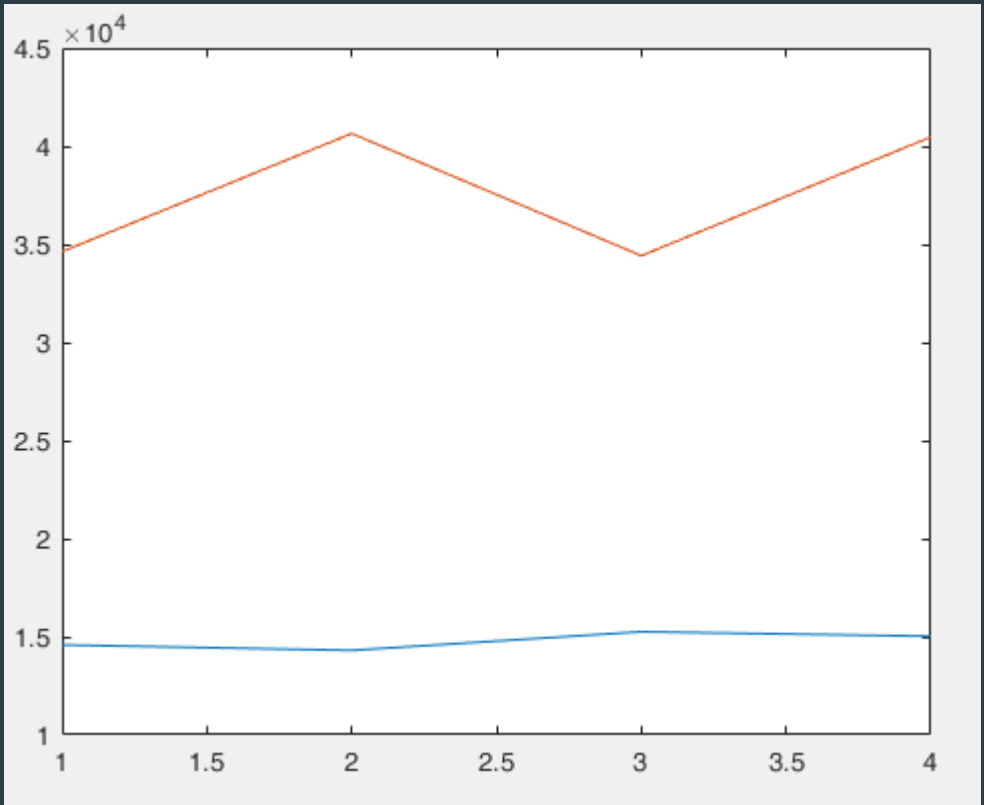
  for jj=center_px-search_range : search_range : center_px+search_range

- Full search search when draw the search range: (every pixel)

  for ii=y_start-range : y_start+range

  for jj=x_start-range : x_start+range

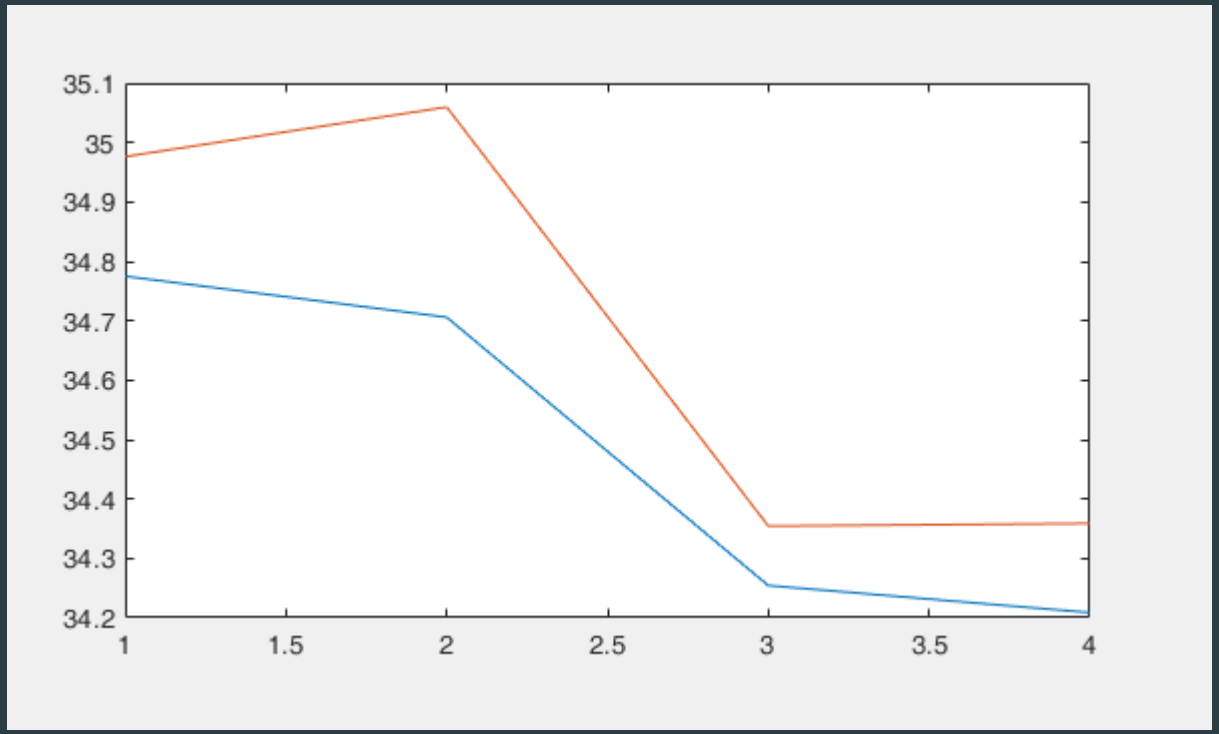
Total SAD



1: Block size=8; Range=8
2: Block size=8; Range=16
3: Block size=16; Range=8
4: Block size=16; Range=16

Orange: Full
Blue: Three-step

PSNR



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Orange: Full
Blue: Three-step

For frame432 and frame 439

- PSNR = 33.9985

Execution time for two search algorithms

	Block size=8 Range=8	Block size=8 Range=16	Block size=16 Range=8	Block size=16 Range=16
3-Step search	1.1010	1.2919	0.3694	0.4957
Full search	9.2096	33.1688	2.8472	10.3994

Compare and discuss the execution time with the theoretical time complexity

- 3-Step search is much faster than Full search
- Full search scan every pixel in the search range, 3-step skips and reduce search range for every loop

- Block size larger, less execution time
- Range larger, more execution time