

# ENEE631 Assignment 4

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## 1 MPEG Video

List the parameters you choose for the vector mpg\_option

- (a) [1 0 0 1 10 2 2 4] achieved PSNR 26.0292 dB > 26 dB and Bit Rate 1,833,096 bps.
- (b) [1 0 0 1 10 18 23 28] achieved PSNR 24.0220 dB and Bit Rate 396,936 bps < 400 Kbps

Give a rule of thumb on how to choose those parameters in step 1

To increase PSNR (to increase accuracy), decrease quantization scale. To increase Bit Rate, reversely, increase quantization scale. Of course, this results in decreasing PSNR.

We can also change parameters for choice of algorithm to achieve better PSNR or bps, but I did not use them because what I wanted to do here was to make PSNR or bps close to goals gradually.

## 2 Motion Estimation and Compensation

Draw block diagrams illustrating the hybrid video encode and decoder based on motion compensation and DCT transform coding

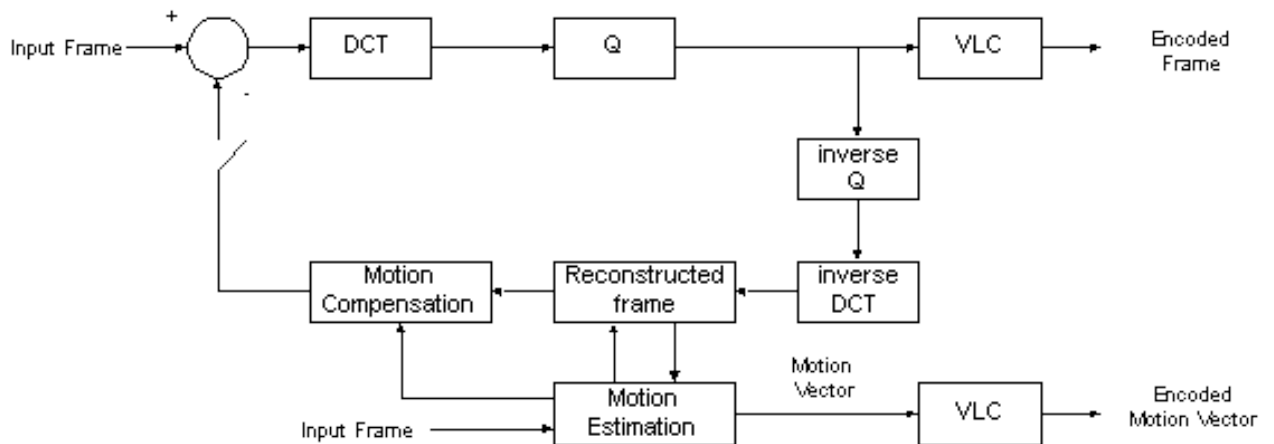


Figure 1: Hybrid MC DCT Encoder

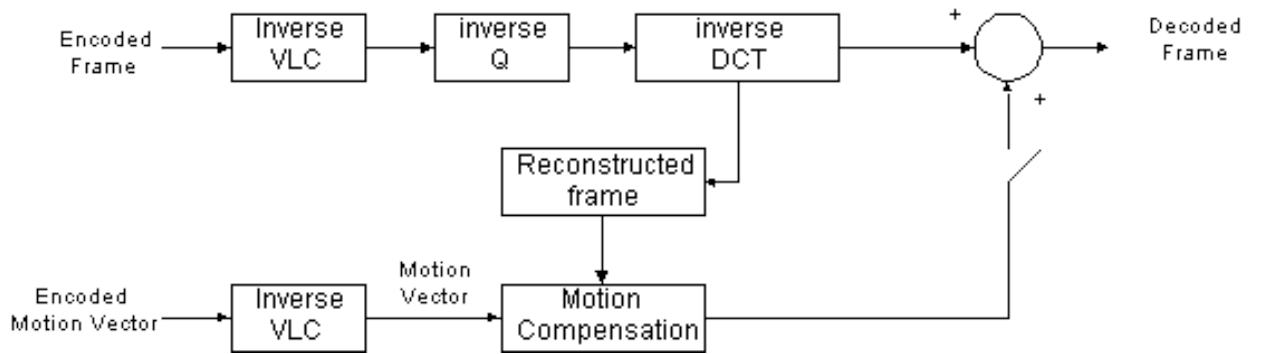


Figure 2: Hybrid MC DCT Decoder

## 2.1 Motion Estimation

### List of Matlab codes

- mefull.m - Motion Estimation using Exhaustive (Full) Block Matching algorithm
- demo\_mefull.m - run

### Results



(a) reference frame



(b) current frame

Figure 3: Input Images

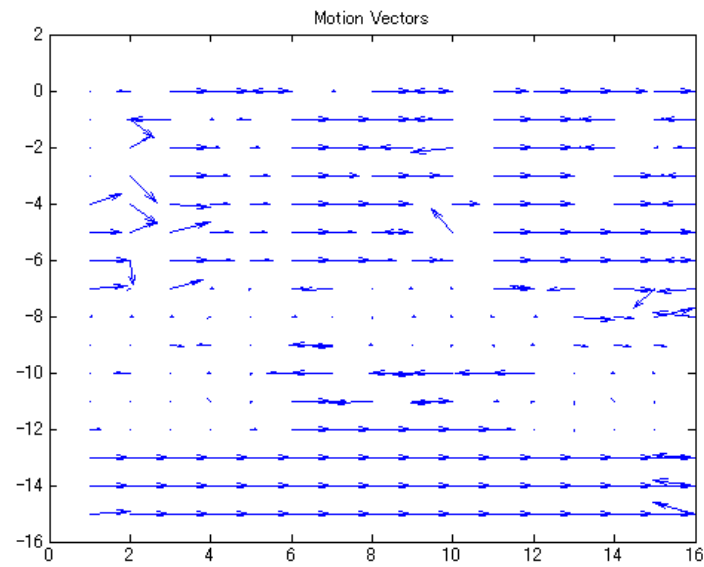


Figure 4: Motion Vectors

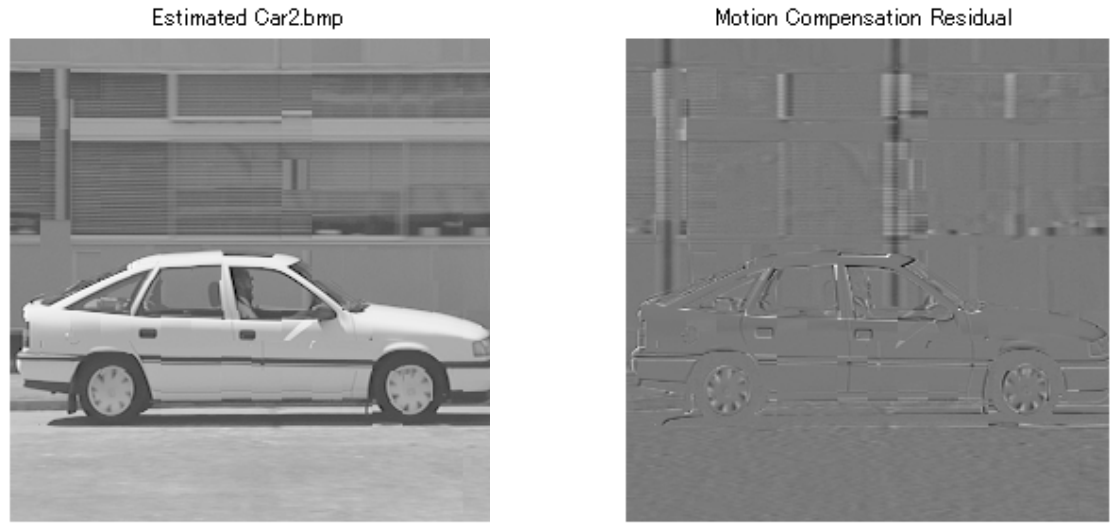
## 2.2 Motion Compensation

### List of Matlab codes

- mc.m - Motion Compensation
- demo\_mc.m - run

### Results

Time (sec) for Motion Estimation	0.894014
MAD	5.260040



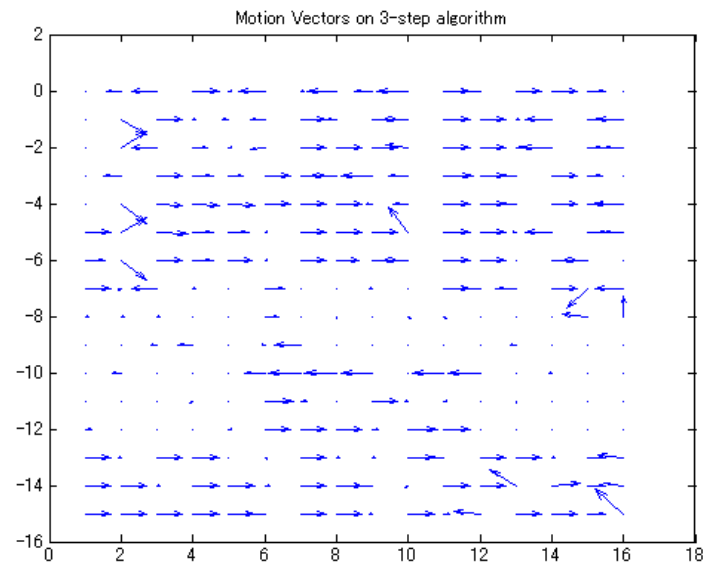
### 2.3 Fast Motion Estimation via 3-step search

#### List of Matlab codes

- mc3step.m - Motion Estimation using 3-step algorithm
- demo\_mc3step.m - run

#### Results

Time (sec)	0.028770
MAD	5.423935



Estimated Car2.bmp



Motion Compensation Residual



## 2.4 Comparative Studies

### Results

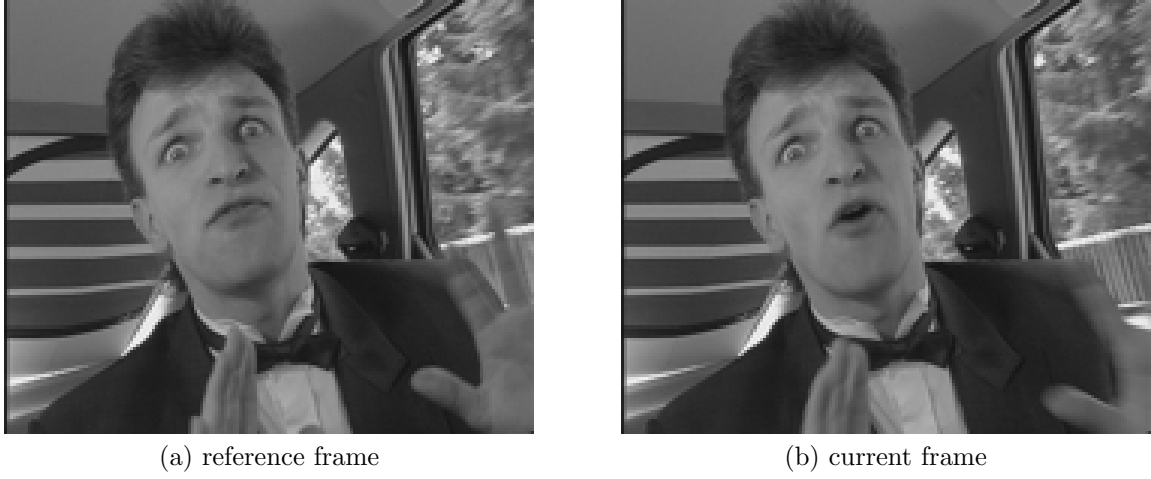


Figure 5: Input Images

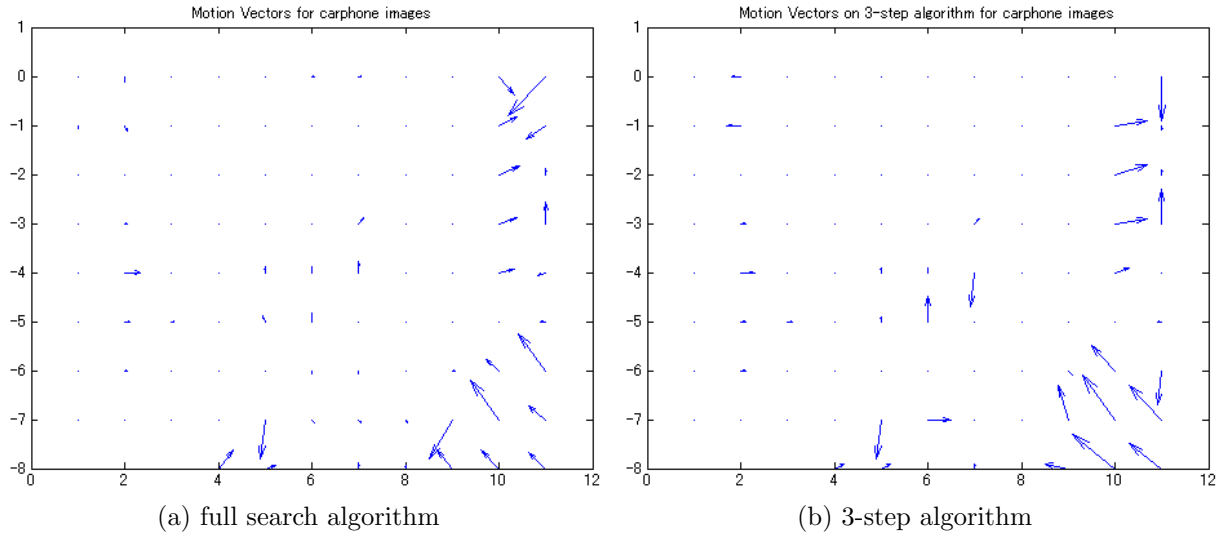


Figure 6: Motion Vectors

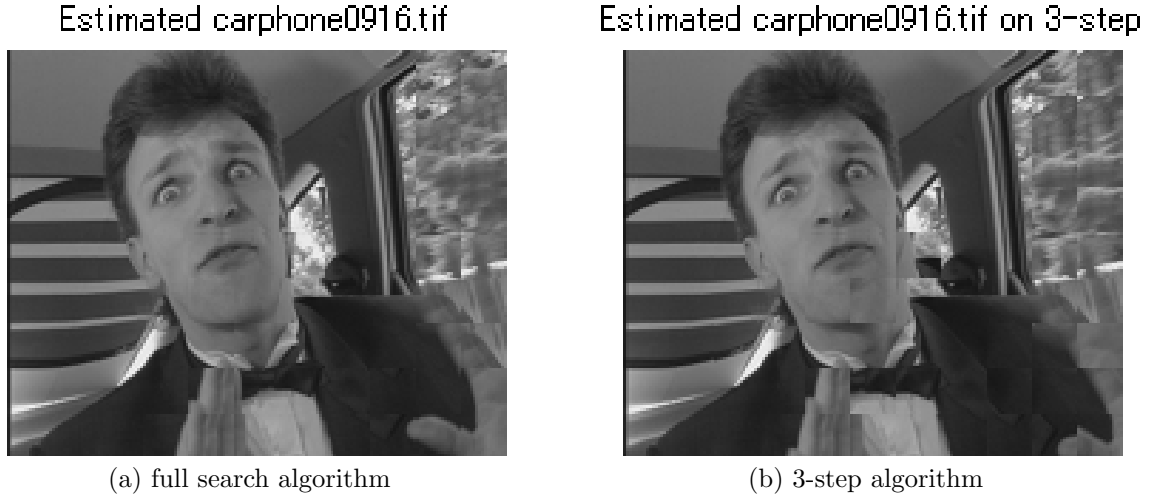


Figure 7: Estimated carphone0916

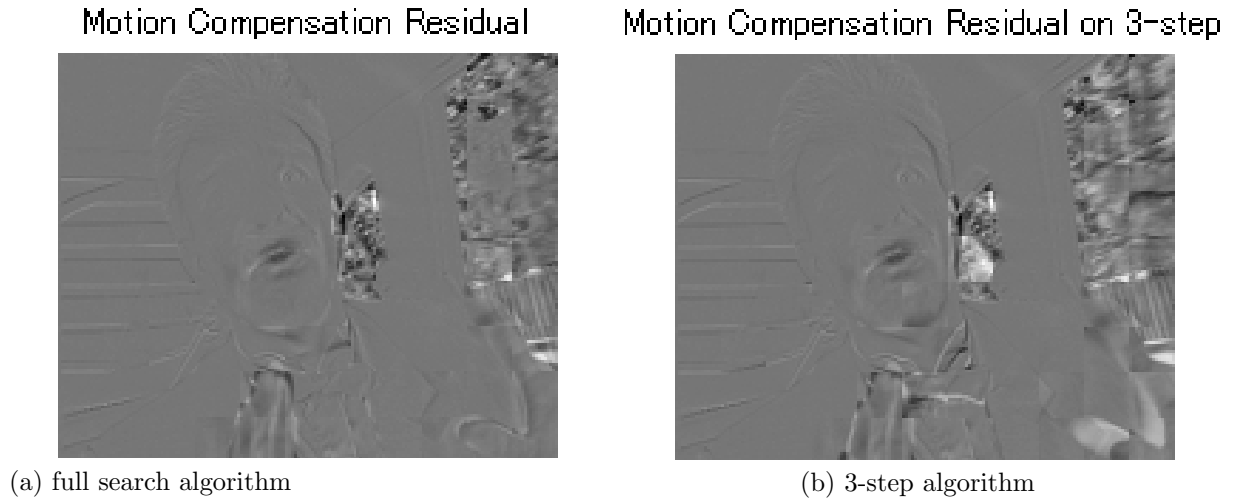


Figure 8: Motion Compensation Residual

	Full Search algorithm	3-step algorithm
Time (sec)	0.44380	0.03743
MAD	5.961293	7.878157

**Discuss the advantages and disadvantages of these two algorithms for each image sequence**

For car image sequence, there was almost no difference on MAD between full search algorithm (5.260040) and 3-step algorithm (5.423935). The computation time was 0.894014 (secs) for full search algorithm and 0.028770 (secs) for 3-step algorithm. Thus, choosing 3-step algorithm would be nice for car image sequence.

For carphone image sequence, there was a bit big difference on MAD between full search algorithm (5.961293) and 3-step algorithm (7.878157). As the case of car image sequence, computation on 3-step algorithm was faster than computation of full search algorithm. Thus, 3-step algorithm has an advantage of computation time and a disadvantage of poor estimation compared with full search algorithm. This statement must be true for most of cases.