HW3 Supplement

MOTION ESTIMATION

reference frame

target frame

macroblock sizes = n×n

target frame

reference frame

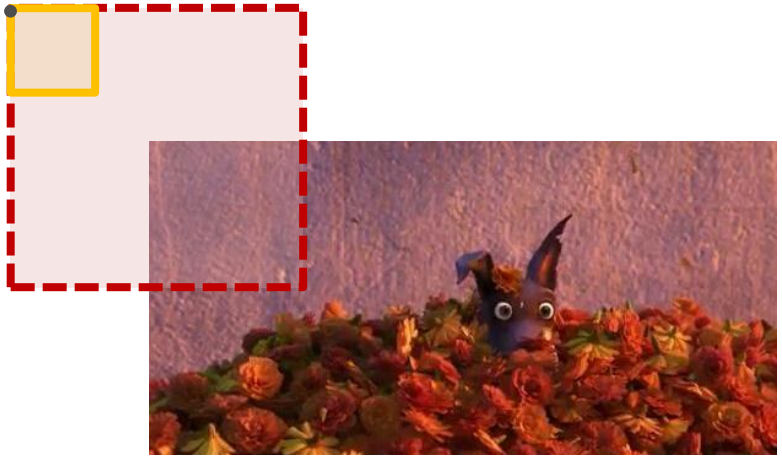
macroblock sizes = n×n

(x, y)

target frame

search range = (2p+1)

(x-p, y-p)



reference frame

macroblock sizes = n×n

(x, y)

target frame

search range = (2p+1)

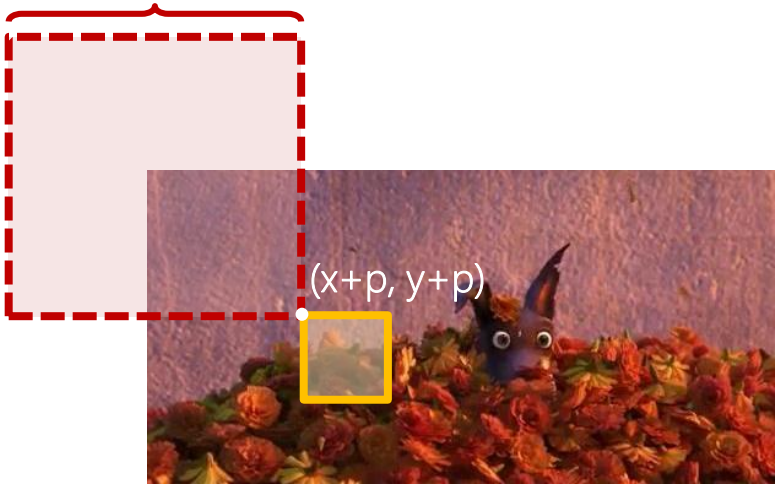
reference frame

macroblock sizes = n×n

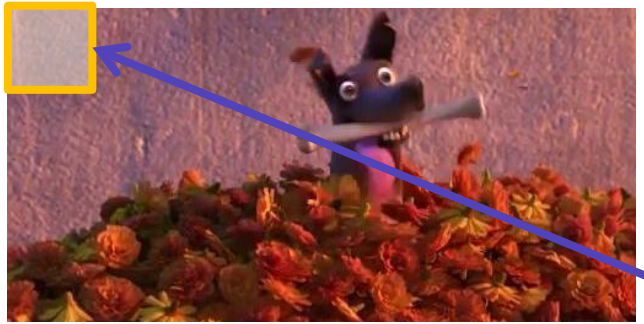
(x, y)

target frame

search range = (2p+1)

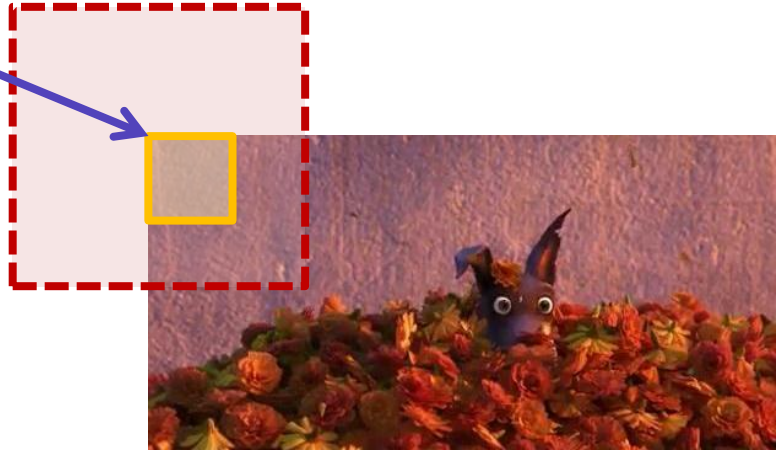


reference frame



target frame

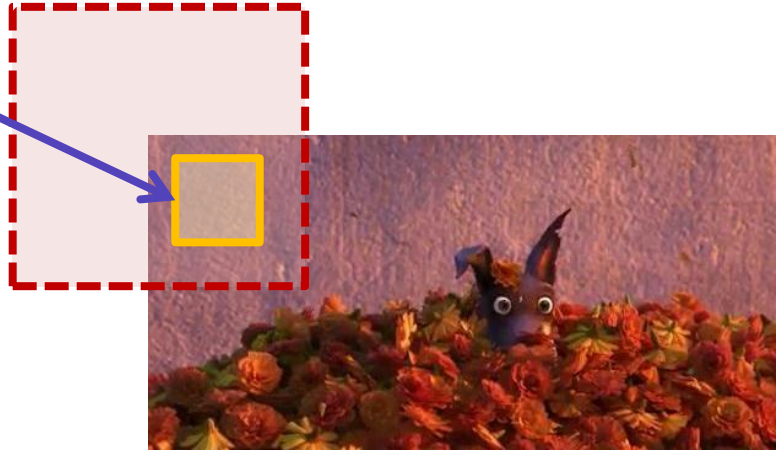
Compute SAD



reference frame

target frame

Find block with min. SAD



reference frame

target frame

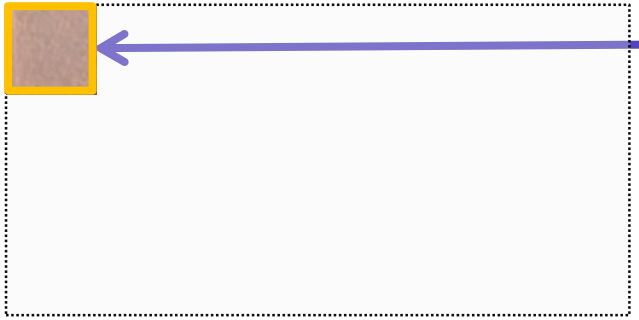
min. SAD

motion vector

reference frame

target frame

min. SAD

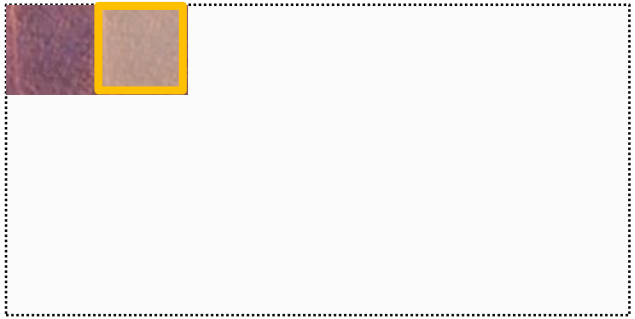


prediction

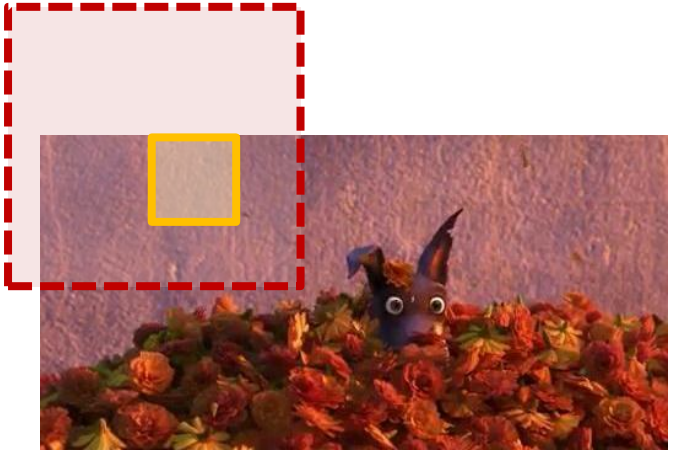
reference frame

next non-overlapping macroblock

target frame



prediction

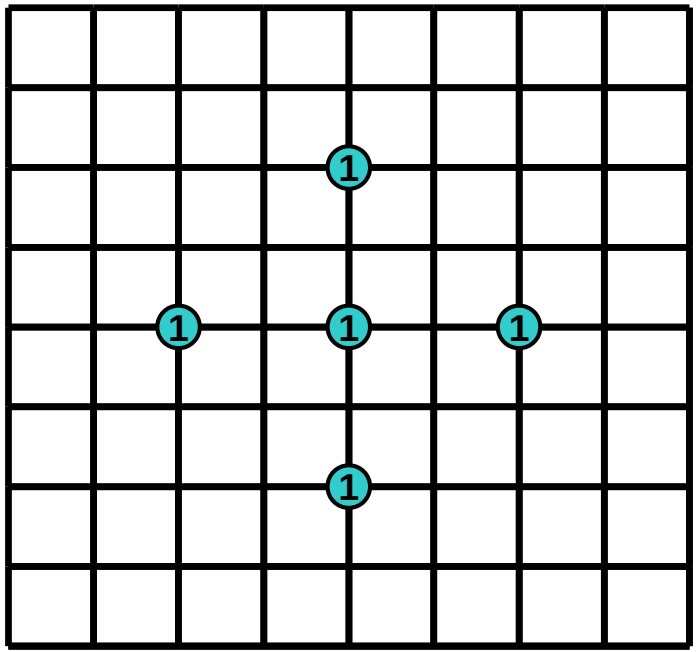


reference frame

2-D Logarithm Search Method

p = 4

search range
(2p+1) = 9



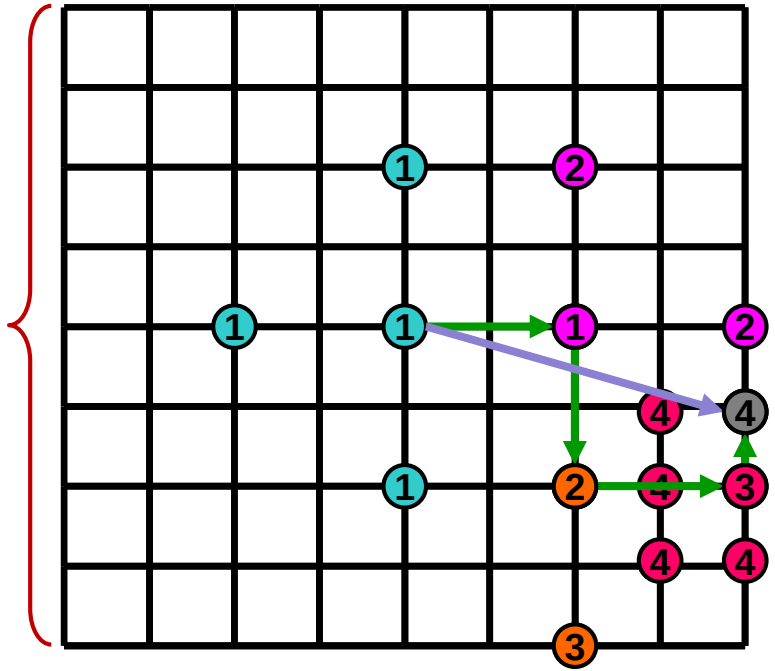
m = p/2 = 2

Search 5 locations:
(x, y)
(x+m, y)
(x, y+m)
(x-m, y)
(x, y-m)

2-D Logarithm Search Method

p = 4

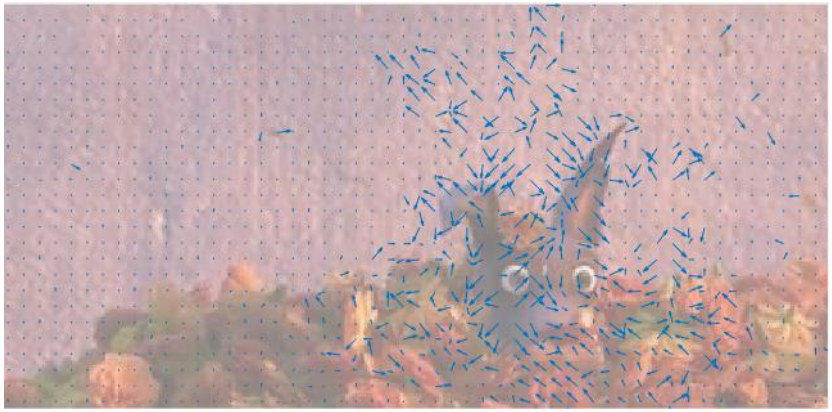
search range
(2p+1) = 9



(Please implement the algorithm as slide p.48)

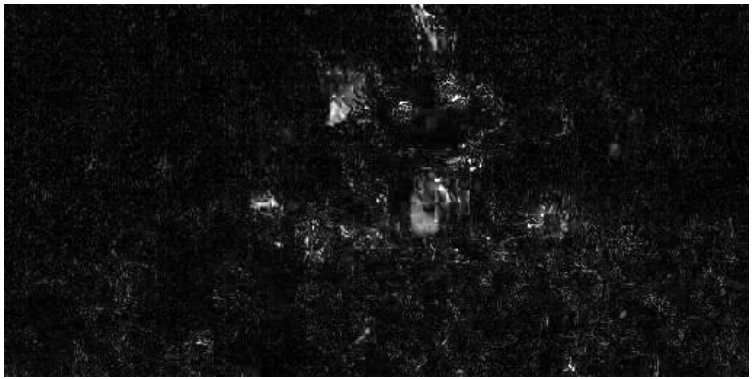
Q1 (b) motion vectors image

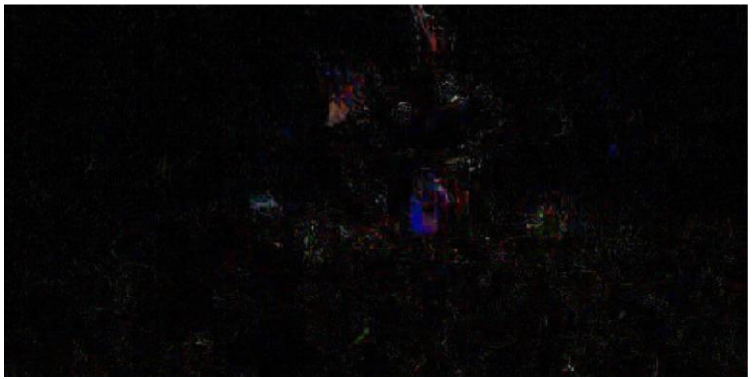
- Save the motion vectors matrix
- Show motion vectors image



Q1 (c) residual image

- The difference between target image and predicted image





Q1 (d) plot total SAD & PSNR

- Total SAD: the sum of minimum SAD of every microblocks

- PSNR: refer to HW1

$$PSNR = 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right)$$
$$= 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right)$$
$$= 20 \cdot \log_{10}(MAX_I) - 10 \cdot \log_{10}(MSE)$$
$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

Q1 (d) plot total SAD & PSNR

- Total SAD: the sum of minimum SAD of every microblocks
- PSNR: refer to HW1

$$PSNR = 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right)$$

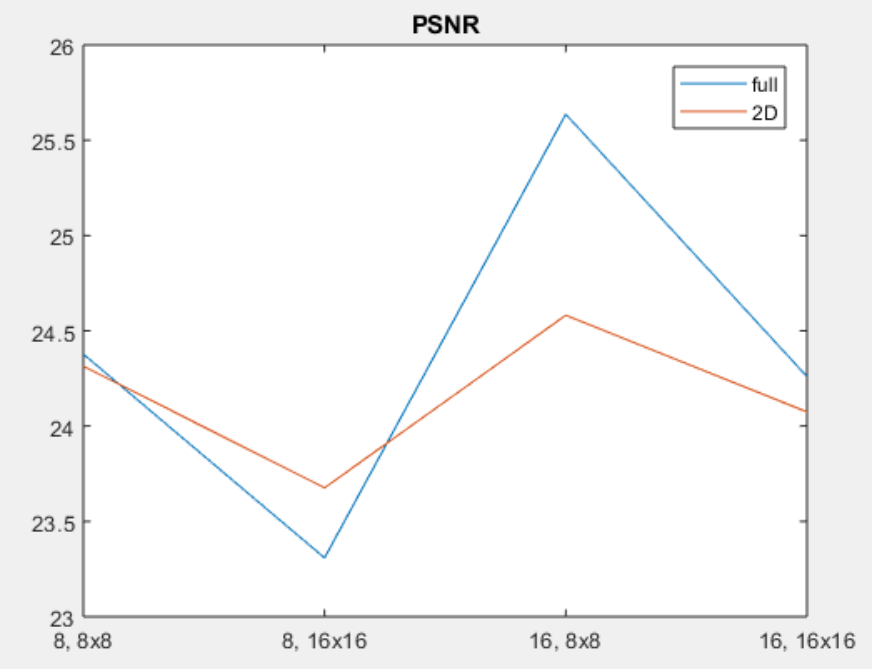
1? 255?

$$= 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right)$$

$$= 20 \cdot \log_{10}(MAX_I) - 10 \cdot \log_{10}(MSE)$$

$$MSE = \frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

Q1 (d) plot total SAD & PSNR



Search range