[1] Fractional Motion Estimation and Compensation, for the “foreman” sequence, please load frames 150 and 151, and try to predict frame 151 from frame 150. (f-150.png, f-151.png provided).

a) [15pts]compute integer precision motion compensation with block size 8x8, and plot the predicted frame 151 side-by-side with 151 original. Also plot the motion vectors (using quiver, as in the example). What is the MSE of the residual? [10 pts], repeat the process with block size 4x4. [5pts] Notice that the max motion search range is 12x12 pixel.

b) [15 pts] compute ½ pel precision motion compensation with block size 8x8 as in a), plot the MV, residual image, and repeat the process with block size 4x4. What is the difference in residual MSE between a) and b) ?

c) [20 pts] B-frame exercise: load the frames 150, 151, and 152, predict frame 151 from 150 and 152 by finding the best match from previous and next frames, i.e, we use a bit to signal if the block is predicted from the previous or the next frame, and only use one block from either 150 or 152 to predict. Compute and plot the integer pel resolution motion residual for frame 151, as well as associated motion vectors (we have forward and backward MV in this case) [10pts], and repeat the process with ½ pel resolution motion compensation [10pts].

2) Fast Motion estimation exercise: load frames 150 and 151 from “foreman” sequence, implement the Diamond search algorithm for fast motion estimation, and report the average number of SAD/SSD operations as compared with the exhaustive search on range 12x12 pixels. For details please refer to:

[12] Shan Zhu, Kai-Kuang Ma, [A new diamond search algorithm for fast block-matching motion estimation](http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=821744), *IEEE Transactions on Image Processing* vol.9(2): 287-290 (2000).