TD 6 -Motion estimation and compensation-video compression

In the last laboratory, you had perfomed motion estimation by implementing a block-matching algorithm for two consecutive frames of a video, F_R and F_C. As a result, you computed the backward **motion vectors** between the two frames, as illustrated in Figure 1.

We can, therefore, construct F_C starting from F_R and given the motion vector mentioned above, thus performing **motion compensated prediction**. More generally, the decoder will use the motion vectors and a prediction error, or motion compensated difference (details below in the *requirements* section) to reconstruct a frame starting from the previous one.

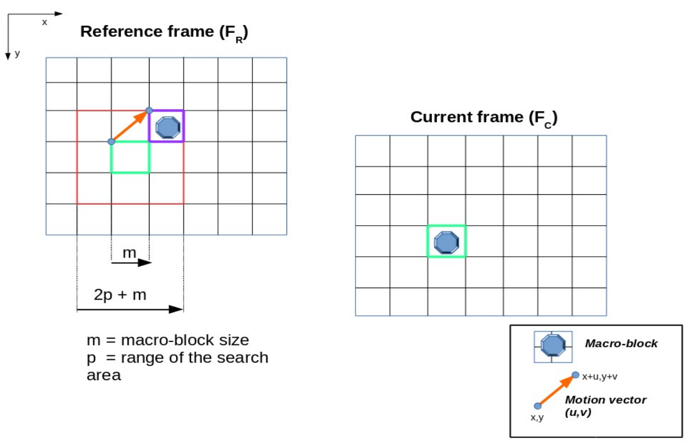

Figure 1: Block-Matching- Exhaustive Full Search

Requirements - Motion Compensation

- Use the motion vectors to create the **motion compensated frame** F_{CC} starting from F_R (the macroblocks from F_R should be placed in F_{CC} in the position indicated by the associated motion vector).

- Compute and display the difference between the frames F_C and F_R, and between F_C and F_{CC}, denoted E_{res} (also known as the **motion compensated difference** or **prediction error**). Compare and explain the results.

- Compute the average motion compensated error as such:

$$mae(F_C, F_{CC}) = \frac{1}{MN} \sum_{i=0}^{M-1} \sum_{j=0}^{N-1} |E_{res}(i,j)|$$

  where [M,N] represents the frame size.

- Plot a graph of the average motion compensated error vs. frame number for the first 20 frames. (**Note**: Compute the motion compensated difference E_{res} for every two consecutive frames) and comment the results.

- Plot a graph of the PSNR (E_{res}) vs. frame number for the first 20 frames and comment the results.