Motion Estimation Algorithm

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Given that during the frame period the image moved d_x in x-direction and d_y in y-direction we'll have:

$$I_2(x, y) = I_1(x - d_x, y - d_y)$$

and in frequency domain:

$$F_2(\omega_x, \omega_y) = e^{-j(\omega_x d_x + \omega_y d_y)} F_1(\omega_x, \omega_y)$$

Hence,

$$\frac{F_1(\omega_x, \omega_y) F_2^*(\omega_x, \omega_y)}{|\omega_x, \omega_y) F_2^*(\omega_x, \omega_y)|} = e^{j(\omega_x d_x + \omega_y d_y)}$$

IDFT of above normalized cross-correlation gives a delta function at position (d_x, d_y) from which we can estimate the velocity vector.