Question 3 170010047

(a) Since there are statistical dependencies within a spatial neighbourhood as well as across RGB channels,

We choose a six-neighbourhood system as follows,

For each pixel in every channel (say Green), ~~$x(i,j)$~~ $x_G(i,j)$, its neighbours will be,

$x_G(i-1,j)$, $x_G(i+1,j)$, $x_G(i,j-1)$, $x_G(i,j+1)$,

$x_R(i,j)$ and $x_B(i,j)$

Although there are statistical dependencies across RGB channels, but we do not want to lose out on the possibility where one channel has high intensity value as compared to the others in a pixel, say for example, in the image of a red apple.

Hence for the above six-neighbourhood system, we may use the non-convex function,

$$g(u) := -\gamma \exp(-|u|^2/\gamma)$$

(b) For each channel, ~~then~~ for each pixel we may use the poisson noise model as it is suitable when the noise level depends on the number of photons.

(C) Together with the g(x) function described in part (a) and the poisson noise model, we use the ICM optimization technique to optimize the pixel value of each channel turn by turn, i.e., we may pass through the Red channel pixel by pixel, and then for Green and then for Blue, similar to what we do for grayscale image.

This way we would decrease the negative log posterior (of the entire image) and once we see that the log posterior doesn't change much, we can stop the iteration and the image obtained is the denoised RGB image.