Digital Image Processing – Part 2 Explanation

Results:

Blurred with filter	Reconstructed with filter	PSNR value (compared to the original image)
Sinc	Sinc	17.72
Sinc	Estimated sinc	19.22
Sinc	Estimated gaussian	18.66
Gaussian	Gaussian	18.22
Gaussian	Estimated gaussian	19.02
Gaussian	Estimated sinc	19.55

* Estimated sinc/gaussian means the output kernel from applying the algorithm on low-resolution image blurred with sinc/gaussian.

Discussion:

We can see that for both low-resolution images blurred with sinc and gaussian filters, the worst PSNR value was achieved when using the same filter for reconstructing the image, which aligns with the paper's results.

For the sinc image, we can see that the PSNR value when reconstructed with the estimated sinc kernel is better than the value of the high-resolution image reconstructed with the estimated gaussian kernel.

On the other hand, for some reason for the gaussian low resolution image we get the opposite result – we get better result than when reconstructing with the wrong kernel (19.55 for the wrong vs. 19.02 for the right kernel).
This value is even better than the value of the image generated with sinc and constructed with sinc.

Some possible explanation can be that both kernels have similar characteristics in the frequency domain as they are both low-pass filters.
It's also possible that in the low-resolution image generated with sinc filter, there were more recurring patches than in the image generated with gaussian filter, so it was more suitable for the algorithm (which is based on finding recurring patches in the image), which led to providing better result, regardless of how the image was blurred in first place.