CSC320A4

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The following images we are using for the experiments are produced by Nikon D200 with highest ISO setting under poor lighting conditions to produce more noise on the source image.

Experiment on k:

Source Image on Jaguar

NLM on Jaguar2 with default values

NLM on Jaguar2 with k = 3 and other default values

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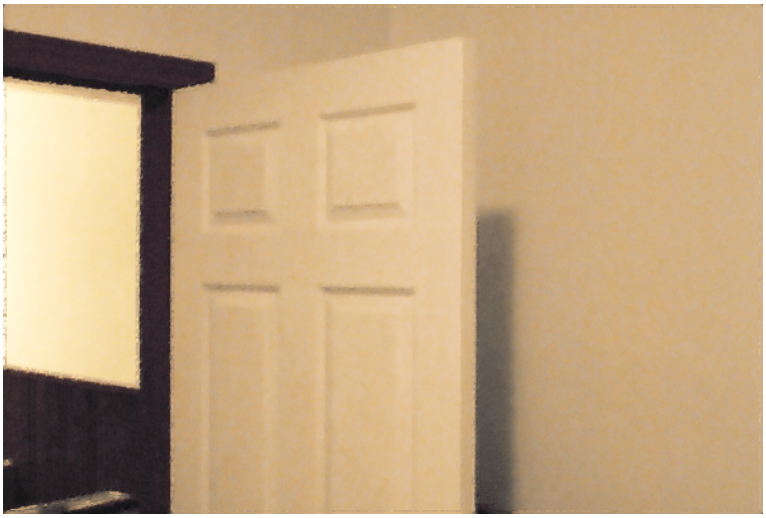
Source Image on Door

NLM on Door with default values



NLM on Door with k = 3 and other default values

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Source Image on Curtain

NLM on Curtain with default values

NLM on Curtain with k = 3 and other default values

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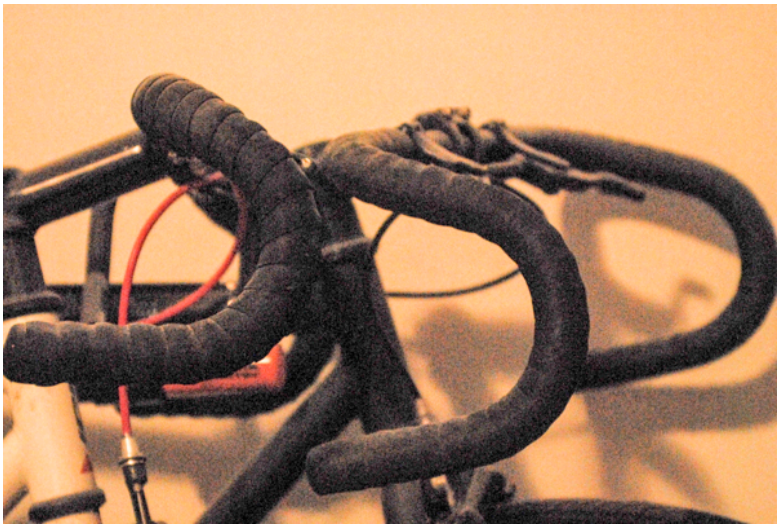
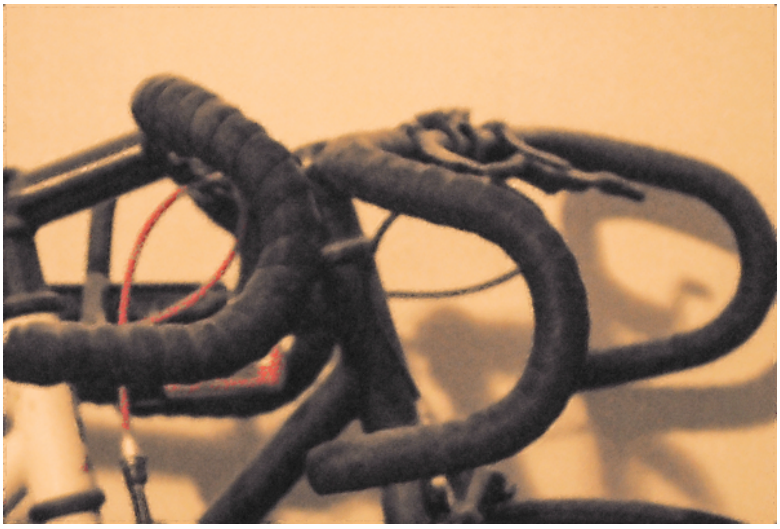
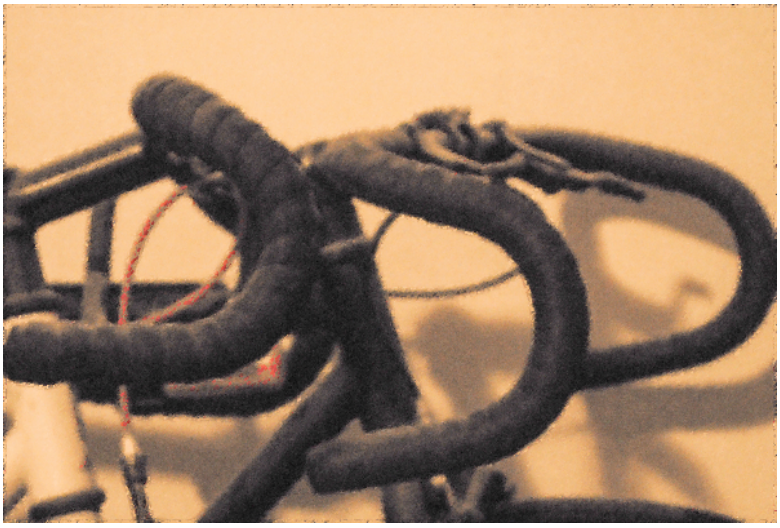
Source Image on Bike



NLM on Bike with default values



NLM on Bike with k = 3 and other default values



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This part of the experiment is on the k value of k nearest neighbours. For each source noisy image, we used the default k=15 and k=3. For each result, there is noticeable difference between the result with larger k and smaller k. Result with larger k value have better de-noising effects, the image is smoother and less noise. For example, in the door image, the shadow of the door for k=15 has significantly less noise than k=3. This is because with larger k, more neighbours are searched, so the weighted sum of NN is closer to the true image with no noise (different noises cancel each other out in the sum). Thus, the de-noising result is better for larger k.

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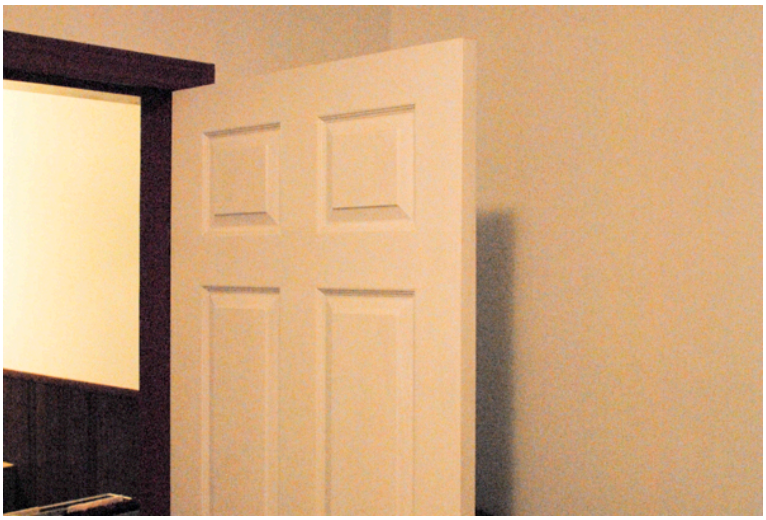
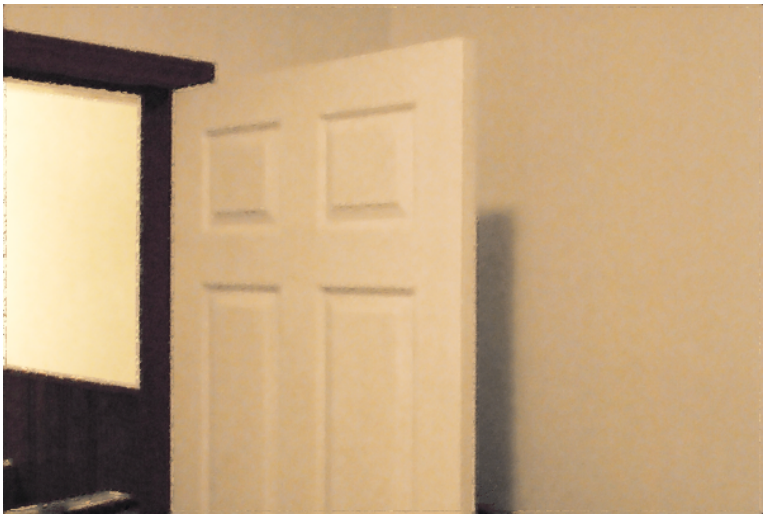
Experiment on patch-size:

Source Image on Door



NLM on Door with default values



NLM on Door with patch-size = 3 and other default values

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Source Image on Curtain

NLM on Curtain with default values

NLM on Curtain with patch-size = 3 and other default values

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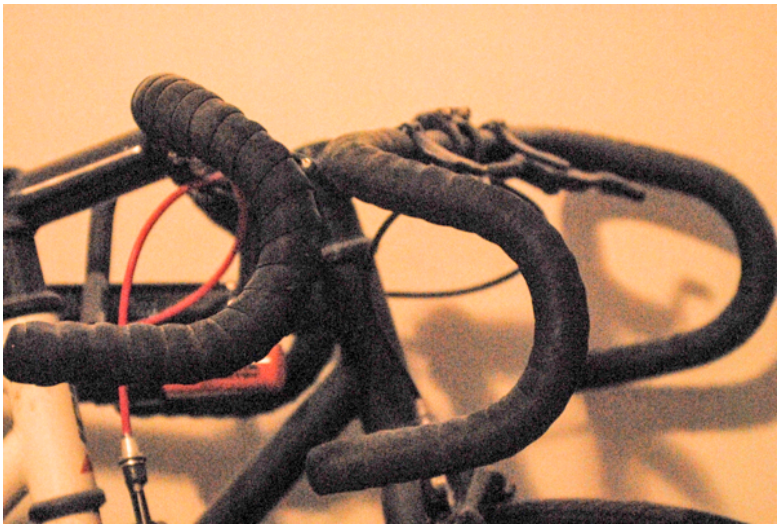
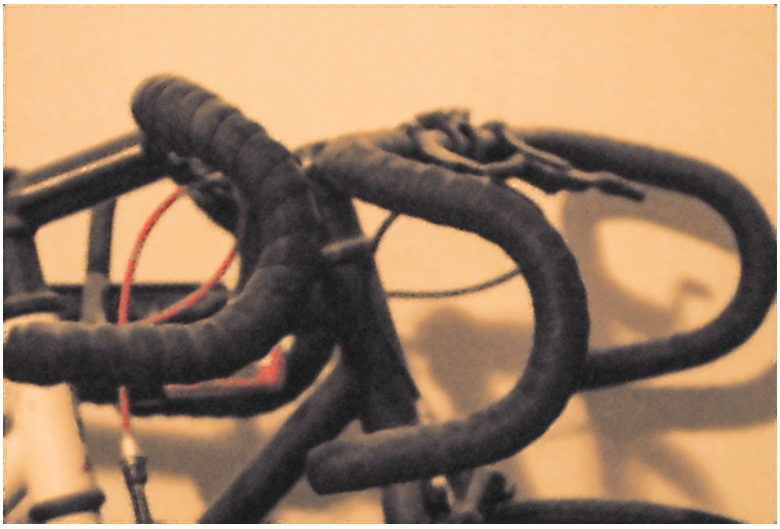
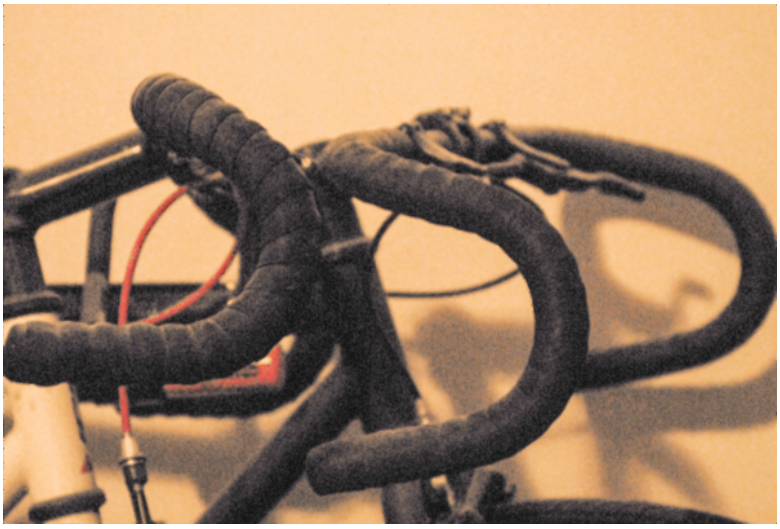
Source Image on Bike



NLM on Bike with default values



NLM on Bike with patch-size = 3 and other default values



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This part of the experiment is on the patch-size value. Since the value must be odd, we used the default patch-size=7 and patch-size=3 for each of the noisy image. For each result, there is small noticeable difference between the results with different patch-sizes. Result with larger patch size of 7 have slightly better de-noising effects. For example, there is a more noticeable difference on the bike image. The bike result with patch-size=3 is noticeably sharper than the patch-size=7 counterpart and has more noise. This is because with a larger patch, there are more neighbours to select for the k-NN, thus increasing its accuracy. Therefore, larger patch sizes get better de-noising result.

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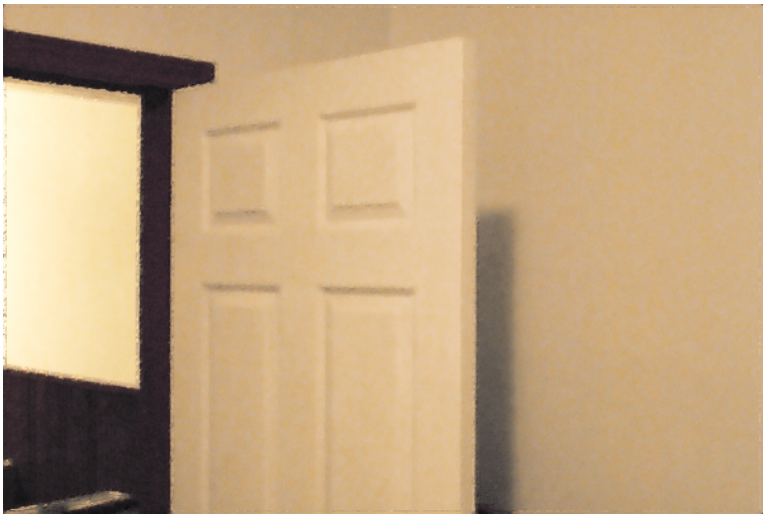
Experiment on search radius:
Source Image on Door

NLM on Door with default values



NLM on Door with radius = 100 with other default values

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Source Image on Curtain

NLM on Curtain with default values

NLM on Curtain with radius = 100 and other default values

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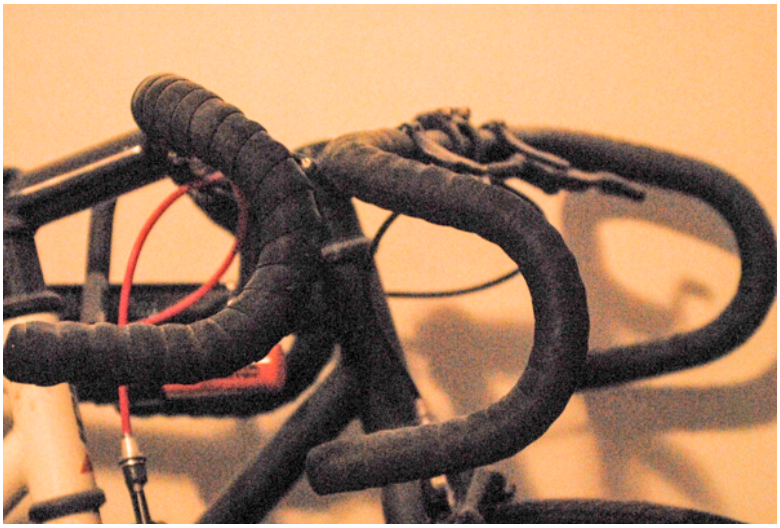
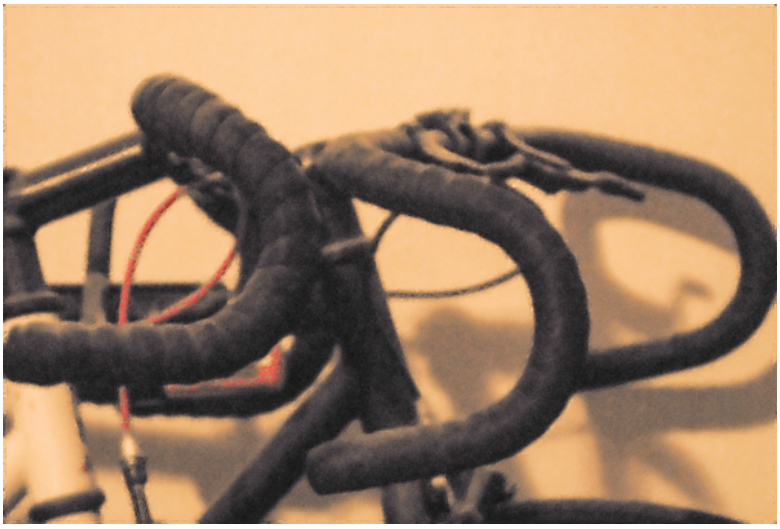
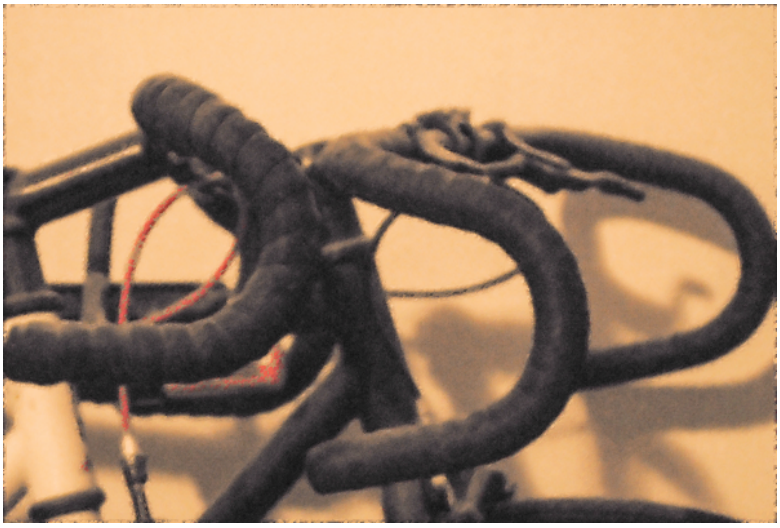
Source Image on Bike



NLM on Bike with default values



NLM on Bike with radius = 50 and other default values



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This experiment is on the searching radius 'w'. For each source noisy image, we tried with the default maximum parameter , a smaller parameter of w=100 and an even smaller parameter of w=50 for the bike since it has more details. For each of the result, there were no significant difference between the de-noised image with default parameter w and de-noised image with w=50. This is because while the algorithm is a patch_match algorithm, we are focusing on the de-noise part of the result. For de-noising, the source image and the target image is the same image, so even with a small search radius, the matching patch can be found because its in the same location. For this reason, search radius 'w' does not affect the result of our de-noising experiment.